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Technical World Magazine

HENRY M. HYDE, Editor

Contents for March, 1912

Cover Design — Dan Sayre Groesbeck

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Technical World Magazine should be on the news-stands on the 17th of the month preceding the date of issue. Patrons unable to get the magazine on the 17th will confer a favor by notifying the Circulation Manager. News-stand patrons should instruct their Newsdealer to reserve their copy of Technical World, otherwise they are likely to find the magazine "sold out".

TERMS: $1.50 a year; 75 cents for six months; 15 cents a copy. Foreign postage, $1.00 additional; Canadian postage, 50 cents additional. Notice of change of address should be given thirty days in advance to avoid missing a number.

TECHNICAL WORLD COMPANY

58th St. and Drexel Avenue, Chicago — 1 Madison Avenue, New York

Entered at the Postoffice, Chicago, Ill., as second-class mail matter.

TECHNICAL WORLD MAGAZINE FOR APRIL

WHO MAKES THE PRICE OF WHEAT?

Thirty years ago David Lubin began asking himself that question. Graduated from the Ghetto of New York, he had drifted to California, developed into a wealthy merchant, and become inspired with the purpose to serve his fellow men.

California was the finest wheat country in the world, yet it could not raise wheat at a profit because "the market" was against it. Lubin wondered what "the market" might be, and why it prevented California from raising wheat that millions of people needed.

He set out to answer the riddle. Other men had been asking the same sort of questions from the dawn of economic science. Lubin went about it in a new way, and found the answer. That made him different.

In his remarkable article on David Lubin: the Ghetto Boy, Judson C. Welliver tells what this answer is, and how this once obscure Jew has brought together fifty nations in an economic world parliament. No stronger or bigger article has appeared in any magazine so far this year.

A FOLDING BUNGALOW

By

ROBERT H. MOULTON

A charming description of a new sort of residence

PHEASANT FARMING

By

FORREST CRISSEY

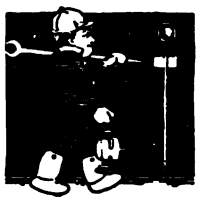
At once adequate and entertaining

YELLOW CONTRABAND

By

CHARLTON LAWRENCE EDHOLM

All the romance of the smuggling industry still flourishes on the Pacific Coast. Only it is men—the despised Chinese—not merchandise—whom cool and desperate crooks endeavor to slip ashore in the darkness of the night. "Yellow Contraband" is a thriller, and every word of it is true.



THE MEN WHO WALK THE TRACKS

You know Bailey Millard's striking articles. You know how full they are of the spirit of the work men are engaged in. "The Men Who Walk the Tracks"—the humble servants of the railroads, who test every inch of the way, live lives punctuated with dangers and thrills and pathos. Mr. Millard has succeeded in getting some of them to talk, and he presents the results in his usual fascinating manner.

MARCH

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WHERE THE COPPER RIVER RAILROAD STARTS.
The town of Cordova, on an inlet of the Gulf of Alaska. The harbor is an excellent one.

—*"It had to Be Done"*

THE TECHNICAL WORLD MAGAZINE

VOL. XVII MARCH, 1912 NO. 1

"IT HAD TO BE DONE"

By

CARLYLE ELLIS

FROM the pocket diary of E. C. Hawkins, the engineer who built the Copper River and Northwestern Railway in Alaska, under date of May 14, 1910, we read the following entry:

"The falsework under the third span of the bridge was moved out fifteen inches by the ice and *had to be put back.*"

That was all. Even the italics were not in the original entry.

Now that third span of the Miles Glacier bridge was fifty feet long. The falsework consisted of a thousand or two piles, driven deep into the bottom of the Copper River, forty feet below the surface. The ice was a solid sheet seven feet thick and it was borne on a twelve-knot current. Into it the forest of piles was solidly frozen.

The spring breakup had begun on the river, the ice-cap, lifted twenty feet above its winter bed by the flood, was moving. The falsework, carrying a mass of unfinished steel, was fifteen inches out of line and *had to be put back.*

When the rising water began suddenly to lift the ice and with it the 450 feet of falsework on which the third span was being put together, there was a preliminary emergency of some consequence. It might easily be but an hour or two's work for the resistless river to wreck the whole span that way. The emergency was met, as scores of others had been before.

The steam from every available engine was driven into small feed pipes and every man in camp was put to work to steam-melt or chop the seven feet of ice clear of the piles. And it was done. The holes were kept open through day and night of bitter cold and the hundreds of cross-pieces unbolted and shifted while the river rose twenty-one feet.

Then began the movement downstream. At first it was but an inch a day; then three or four inches. The melting and chopping went on almost unceasingly. Then the ice made its heaviest charge. A line was taken. The falsework was fifteen inches out and it *had to be put back.*

Anchorages were hastily built into the ice above the bridge and they were heavy anchorages. Block and tackle was rigged to them and while a gang thawed and chopped at the ice around the piles in the maddest of races the whole 450 feet of towering bridge was dragged inch by inch back into place.

You see, it *had to be put back.*

The rest was a still more furious race with the ice, for it was moving each day more freely. The last bolt of the span was sent home at midnight after an eighteen-hour day of one shift. The

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great steam traveller was shut in a temporary resting place on the third pier, blocks were knocked out and the third span settled home on its concrete bed.

At one o'clock the whole 450 feet of falsework was a chaotic wreck. The river had won its fight—too late, by less than a single hour.

That hour meant a year saved and that year a fortune.

This was but one of Mr. Hawkins' shattering victories in his conquering of the Copper and he characteristically transferred the entire credit to the men who were under him, in this fashion:

"They were on the job at seven in the morning, no matter what the weather. They worked without ceasing till the noon whistle blew, then raced each other to the mess tent. A few minutes later they were flying back like an army of squirrels. And there they stayed until eleven or twelve at night, or until flesh and blood could stand no more. It was the most amazing exhibition of loyalty, efficiency and endurance I have ever known."

This 1,500-foot bridge had to

THIS IS THE MILES GLACIER BRIDGE ACROSS THE COPPER RIVER, IN THE BUILDING OF WHICH THERE WAS A TERRIFIC RACE AGAINST THE SPRING BREAKUP OF THE ICE.
The upper photo shows the men who won the big race with ice, and established a record in bridge building

BAIRD CANYON OF THE COPPER RIVER THROUGH WHICH THE COPPER RIVER RAILROAD CROSSED A GLACIAL MORAINE STILL UNDERLAIN WITH ICE.

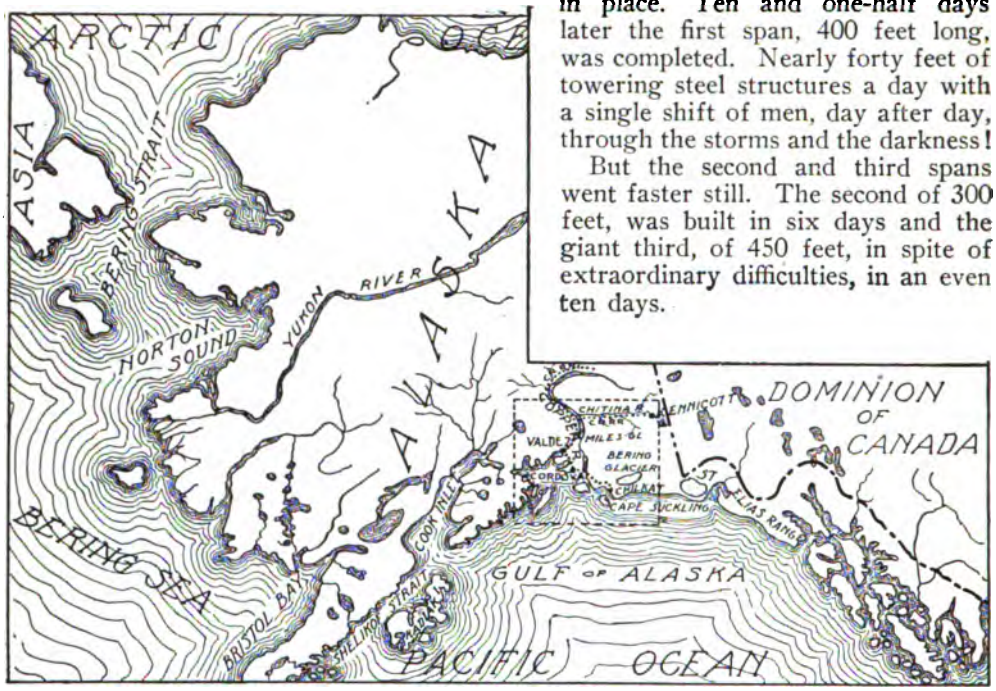
be built across the river where it makes a double turn between the great living glaciers, Miles and Childs. Both present three-hundred-foot cliff-like faces to the water for three miles and if it were not for the turn between them the Copper Valley would be, as was once supposed, utterly impassable. Where the bridge must stand the current brings down an endless flotilla of giant bergs, many as big as a mansion, and would hurl them at twelve miles an hour against the bridge piers. In addition these piers must withstand the breakup of the seven-foot ice sheet under enormous pressure each spring. No such problem in bridge-building had ever been met before. It was one of the many "impossibilities" that faced Hawkins. A million dollars must be risked on the chance that he and his cohorts could build piers that the ice couldn't smash. And if they failed in this the whole $15,000,000 enterprise failed, for the Glacier Bridge was the key to the road and it was built under a battery of gloomy predictions as well as under a battery of bergs.

The great concrete piers, begun through the winter's ice, were driven forty to fifty feet through the river bottom to bedrock and there anchored. They were built of solid concrete heavily reinforced with steel. A row of eighty-pound rails was set a foot apart all around and the whole structure bound together within the concrete in an amazingly massive manner. Then, above the piers, ice-breakers of the same construction were raised.

Before the pieces were half finished a lake burst out from the upper glacier and the river rose twenty feet in an hour. Here was a ticklish test—and the bridge stood.

On account of the floating ice no temporary bridge was possible here and work beyond could not wait two years for the big bridge. So a ferry was established in the stiller water above the bridge and almost under the shadow of the discharging glacier. Back and forth, all summer long, the ferry, built on the ground, of wood brought from "outside," dodged in and out among the bergs. Time after

time the heavy piling of her temporary docks was snapped out by floating ice. Almost infinite were the difficulties encountered but somehow, pile-drivers and engines, horses and supplies, were got across and the line started on northward through the ensuing canyons.



Map of Alaska Showing the Region Tapped by the Copper River Railroad.
The Copper River country is rich in copper and coal.

Meanwhile the great piers were finished and in the autumn of 1909 the steel began to move forward from the East. It was not until late in the spring of 1910 that the last numbered piece was on the ground, the whole thing checked and rechecked in fear of a single miss, which might delay the whole great work a twelvemonth. This steelwork must be done in winter since no falsework would stand against the moving ice.

The checking of the steel was completed on April 5, which left less than six weeks to put together more than 1,100 feet of extra heavy bridge with a single crew of steel workers. Facing such a task and with the prospect of raging storms of rain, sleet and snow about half the time, almost anyone but Hawkins and his bridge engineer, A. C. O'Neal, would have thrown up his hands in hopeless despair.

Within an hour of the time the last piece was checked the first big girder was in place. Ten and one-half days later the first span, 400 feet long, was completed. Nearly forty feet of towering steel structures a day with a single shift of men, day after day, through the storms and the darkness!

But the second and third spans went faster still. The second of 300 feet, was built in six days and the giant third, of 450 feet, in spite of extraordinary difficulties, in an even ten days.

An Enlargement of the Section Blocked on the Map Above.
This map is based on that of the chief engineer of the Copper River Railway Co., E. C. Hawkins.

The bridge was completed on May 16, except a fourth span which was over shallow water above the danger of ice. The 1,150 feet of bridge was thus built

LINING SUPPLIES UP THE LOWER END OF THE COPPER RIVER AHEAD OF TRACK LAYING.
This is most arduous and quite often very dangerous work.

in an elapsed time of just under six weeks and an actual working time on the steel of twenty-seven days.

This building of the Miles Glacier bridge was but one incident, though an important one, in the construction of the Morgan-Guggenheim's Alaskan railroad. It was all a battle, and a fierce one, from beginning to end. The road is now completed to its terminus 193 miles from tidewater and trains run from end to end of it throughout the year. The fight is forgotten in success.

And to this day very little has been heard of the man who won, or will be, if he has his way. But Erastus Corning Hawkins has in this winning put himself in the very front rank of construction engineers and can no longer be ignored.

Since the Copper River valley was first considered as a possible railroad route to the Alaskan interior, eminent engineers have been declaring such a road's construction and operation impossible. In 1905 Michael J. Heney, the contractor who built the White Pass and Yukon railway, made the perilous journey up the valley on foot and he declared that money and Mr. Hawkins could build a railroad on the preliminary survey he then made.

Even with that the eminent specialists stuck to their opinion, though Mr. Hawkins was the engineer who built that other "impossible" road over the White Pass.

Anyway Hawkins told the Morgan-Guggenheim syndicate, which asked him, that he could do it. The syndicate had bought the great Bonanza mine up in the Chitina country and wanted an outlet for its ore, so it supplied the money and gave the word to go ahead.

Work began in October, 1907, and was continued all winter, Hawkins leading the forces in person, with Heney as contractor. It was heart-breaking work for many reasons.

Copper-River weather is Alaska-coast weather with sundry added features; that is, in winter it is warm and cold by spells and the alternate freeze and thaw, with deep snow and overflows of the streams, produces conditions on such flat ground as the Copper River delta as Nature can equal in no other way.

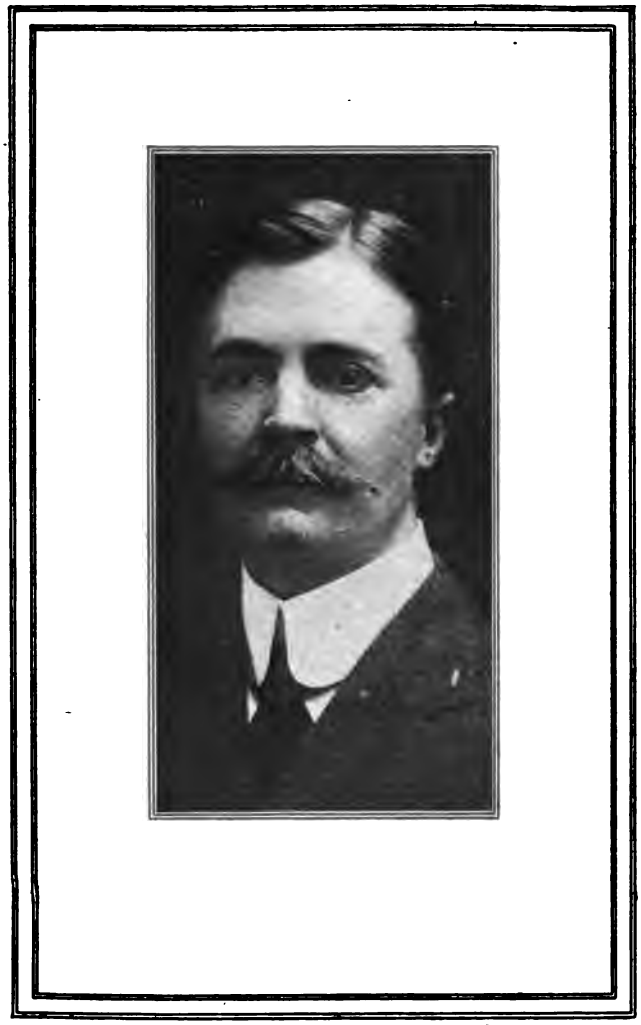
In summer the delta is networked with river channels filled

LOOKING SOUTH TOWARDS THE CENTRAL FRONT OF CHILD'S GLACIER.
Here the channel is but 1,200 feet wide and the ice cliff 300 feet high. The waves from falling ice bergs go clear over the boulder bank shown on the left.

with swift-flowing icy water, glacier streams of all sizes and great overflows. In between and beneath are silt-beds, quick sands and morasses in unimaginable variety but invariably low temperature. The delta cannot be crossed in summer by any living creature except

plies and materials for a thousand men must be got out across those flats somehow. There was no way around; no paralleling wagon roads or navigable waterways, no bridges and no hillsides to follow.

Out onto the flats, already ten feet



THE MAN WHO DID IT BECAUSE IT HAD TO BE DONE.
E. C. Hawkins, engineer in charge of the Copper River Railroad.

winged ones. And every mouth of the river is sealed with silt bars that nothing but a canoe can navigate, as the constructors found to their cost, after repeated trials.

The work, then, must be done in the Alaskan winter. Every pound of sup-

deep in snow the army started, facing continual storms of great ferocity. Hawkins led, as always. Over the snow and through the alternating slush he laid temporary roads of alder brush. If you stepped from these you went waist deep in slush or disappeared in powdery snow.

A QUIET SCENE VISIBLE FROM THE CARS OF THE COPPER RIVER RAILROAD.

Followed the rails, also on snow, and ballast from the far hills as fast as possible. It all sank at every thaw or was buried in the blizzards, but each time they dug it out and bolstered it up so that pile-drivers, ties, rails, wood, food, tents, etc., could be sent forward bit by bit.

There were many stretches of trestle

GREAT SNOW-CAPPED PEAKS RISE ON EVERY HAND IN THE JOURNEY UP THE COPPER RIVER.

THE ICE FLOW AT MILES GLACIER BRIDGE IN DECEMBER. ABOUT FOUR MONTHS PRECEDING THE GREAT STRUGGLE WITH THIS MENACING FORCE.

to be set and three steel bridges to be anticipated with temporary wooden structures and all at top speed, for a time-limit of three years had been placed on the 193 miles of construction and this meant the most unremitting haste in that region.

KUSKALANA CANYON WHICH WAS CROSSED FROM RIM TO RIM BY A STEEL BRIDGE IN THE DEPTHS OF THE ALASKAN WINTER.

The spring breakup, with its further deluges of ice-laden waters and driving rains, found many miles of wobbly, sinking track built, but the work was driven forward harder than ever. There was track connection with a ballast bed that jutted into the delta, however, and it was good ballast, hardening like cement after it was in place. While the construction crew and its advance guard of supply men pushed forward, the completed line was being raised several feet above the delta level. Today that whole stretch of forty miles is an hour's pleasant run over a roadbed that equals almost any in the East and through a country that fairly smiles at you.

But it did not smile to those fighters of the summer of 1908. There were thousands of tons of stuff to be got somehow from the end of the line forward to the fiftieth mile where the biggest job of all waited—the Miles Glacier bridge.

At first they tried taking it up the river in small boats, fifteen or more toughened river men to the boat. The river is deep and swift and icy cold; the banks, of smooth boulders, were often overhung with tangled cottonwoods, matted low by the deep snows. A boat ascending the river here must be "lined up." Ropes are attached fore and aft and it is dragged along the rough shore by stumbling, struggling men, while half the crew are wading waist-deep in the numbing current to keep her off the rocks.

TRESTLE WORK AT THE DELTA OF THE COPPER RIVER.

But a greater danger confronted the boats at the upper end. Here for three miles the river undercuts the glacier and the channel is but 1,200 feet wide. Night and day this glacier discharges a battery of bergs from its disintegrating face. Often a whole cliffside of ice drops a hundred feet and more into the deep river and the waves it sends to the opposite banks are twenty feet high and sweep fifty feet up the boulder-strewn shore, carrying all but the biggest boulders before it.

Past this terrifying onslaught the little cargo-boats had to crawl helplessly and rarely did they get through with a full load. More than once they were dashed to pieces and the men barely escaped with their lives, for no man can swim six strokes in the Copper. Hard as the boatmen worked, they could barely get through more than enough supplies to feed themselves.

Meanwhile a wagonload was being driven through the heavy brush and over sandhills and swamps along the right-of-way and tough western horses were being brought over the flats to do the hauling.

Just this matter of getting in horses was not easy. Little flat-bottomed boats only big enough for one animal were built and they were ferried over the river channels, then dragged over the quicksands by hand—twenty men or more to one horse. Sometimes the animal could walk a little way but progress generally was at the rate of about a mile an hour.

Little by little the rails were sent forward, while at the three main river channels the work of building concrete piers down through the swift yellow current for the steel bridges began. There were a score of difficulties as "insurmountable" as some of these mentioned—actual impossibilities from the viewpoint of ordinary construction standards—that were overcome in the building of that first fifty miles of road.

Work closed down that second winter,

WHERE BRIDGEWORK WAS BEGUN ACROSS A HIGH NARROW GORGE IN THE WINTER TIME.

THE CONSTRUCTION OF THE COPPER RIVER RAILROAD DEMANDED A GREAT DEAL OF BLASTING AWAY OF ROCK.
The photo herewith shown is one of the finest ever taken at the moment of such an explosion. The scattering pieces of stone can be noted in detail.

except for preparations for beginning the big bridge, but early the following spring there began the drive up the canyons. It was heavy work and fast but the easiest of all. The hundred and second mile was reached before track laying stopped. Then began the winter in which the big bridge was completed.

But there were more fights than this that winter. Above the 102nd mile were long stretches of heavy rockwork to be done and large crews were there to do it. Supplies must be kept on the move. It was planned to lay temporary tracks across the river on the ice, but the changing weather kept such a depth of water and slush on its rough surface that even the tough Alaskan horses could not cross. At last a running cable was rigged and a flat-bottomed sledge invented to bobble its way through or over the icy morass.

By this time the fifty miles of upper track was deep in snow and this, with the trains had frozen to solid ice a foot or two thick. At this snow and ice the great rotary with a train of coal cars and two engines was thrown. It made a mile and a half the first day, then disappeared, to arrive at Tickel, fifty miles inland, thirty-one days later. Its first day's run had continued about the daily average for the entire run. In that time the big rotary was off the track not less than 1,500 times, or thirty times to the mile.

Still another hard fight took place beyond the end of the track. Here there was a thirty to eighty-mile haul by sled on the river ice to the scattered camps. But the river froze and thawed and overflowed with appalling regularity; the ice piled itself into almost mountainous barriers, then sank away to pot-holes filled with many feet of slush and water. Hundreds of tons of brush and the work of hundreds of men failed to keep a passable sled road open.

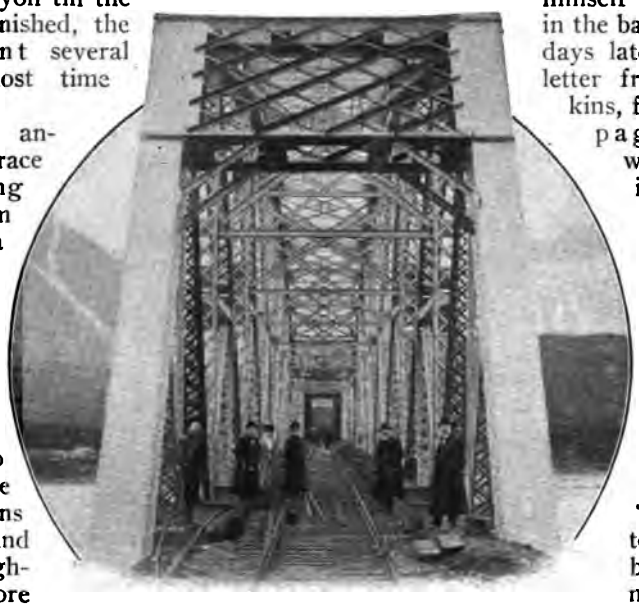
Nevertheless, somehow supplies were got through and when the ice went out 3,000 men were at work. To keep them in food and material three river boats, put together above the roaring cataract of Abercrombie Canyon and powerfully engined, went into early commission and through high water and low they struggled up and down over the shifting bars of Wood Canyon.

So the work went on, still at racing pace, with Hawkins, as ever on the job. Heney, the contractor, himself a remarkable man, worked with him side by side

till the strain and exposure broke his health and he went outside to die.

The winter of 1910-11 saw the Copper again crossed, this time at the 135th mile and the line far up into the Chitina basin. Here another winter bridge fight took place. The deep, narrow Kuskalana Canyon must be crossed from rim to rim. Here a hundred feet or more in the air the steelmen had to work in temperature far below zero and under conditions otherwise most trying. There were delays here and as no materials could be got across the canyon till the bridge was finished, the delay meant several months of lost time beyond.

There was another thrilling race through trying conditions from the Kuskalana to the Bonanza mine at Kennicott, the present terminus of the road. It was ended some months ago and now there are daily trains the year round and the high-grade copper ore deposits of the Chitina, to reach which this terrific construction fight was made, are steadily flowing out to the world and a region, which a few years ago, was one of the most inaccessible in Alaska is now a morning's easy and charming ride from Cordova, the seaport terminus.



THE GREAT MILES GLACIER BRIDGE, 1,100 FEET OF WHICH WAS PUT TOGETHER BY A GANG OF STEEL WORKERS IN LESS THAN SIX WEEKS.

And to Hawkins belongs the lion's share of the great credit that is due. This fight more than most engineering battles of today was a matter of men and he proved a man among men. He staked every shred of professional reputation on as risky an undertaking as falls to the lot of the engineer and his winning placed him among the world's great builders.

Erastus Corning Hawkins was born near New York City about forty-eight years ago and has for many years been identified with engineering projects in the West. That is about all one can learn of him. From him one can get anything but facts about himself. Mr. Hawkins is a most amazing combination of courage and diffidence, of professional daring and personal modesty. After a visit to the construction camps I went to him for additional data. From the engineer, then in the midst of a heavy pressure of work, I received every possible assistance but with the repeated admonition that he himself should be kept in the background. Two days later came also a letter from Mr. Hawkins, four typewritten pages of which were devoted to individual mention of his and Contractor Heney's staff, each of whom, it seemed, deserved credit for especially good work. The letter concluded: "Any reference to myself should be brought to a minimum. My greatest concern is to bring forward the faithful and capable men who accomplished this work."

This is a fine example of the kind of expression the men who really do things give to their deeds.

He meant it absolutely but his wish has not been strictly obeyed, as the reader will have observed. Strict justice to that man would not warrant such a silence.

Reflecting his habit of thought, Mr. Hawkins writes with a fine simplicity and lucidity of expression. His instinctive reserve and professional training make him understate anything in which there is a dramatic possibility and the result is, therefore, sometimes the acme of forceful writing.

Witness that "it *had to be put back.*"

BELT LINE SWITCH AT A COAL DOCK.

NEW ORLEANS AND THE BIG DITCH

By

HENRY M. HYDE

DRAW a line north and south through New York City and practically every foot of the continent of South America will be found to lie to the east of the line.

A line dropped directly south from the tip of Florida will land out in the Pacific Ocean, far to the west of the westernmost coast of South America.

Including Alaska and the Alaskan islands in the territory of the United States on the North American continent, the east and west center of the country is located some scores of miles out in the Pacific Ocean, to the westward of San Francisco.

Those are perfectly apparent, but generally unrecognized, facts to which the imminent opening of the Panama Canal has called attention.

Great commercial cities of the East, South and West, doing their best to get ready for the epoch-making opening of the big ditch, have made these and other equally surprising discoveries in geography. They have been drawing trade lines, with the canal as the center, to show how close each of them is to the vast, undeveloped markets of the Far East and the western coast of South America.

New Orleans, for instance, has figured out that the canal will put her six hundred miles nearer Asia than is New York. With that as a starting point, the Crescent City has gone on to make elaborate preparations for the handling of the enormous trade to which she feels she is entitled by reason of her strategic position.

And, strangely enough, it has remained

BELT RAILROAD TRACKS ON LEFT PARALLELING THE ILLINOIS CENTRAL.

CLEANING ONE OF THE GARBAGE CARS OF THE PUBLIC BELT RAILROAD OF NEW ORLEANS.

for the old French city—the sleepy, exotic, picturesque, old town of magnolias, Creole beauties and Mardi Gras carnivals—to set its more noisy rivals an example of municipal enterprise and far-sighted planning. What is already done is declared by Commissioner of Corporations Herbert Knox Smith, to be "the best example in the country of a practical coördination of rail, industrial and water business, for the benefit of the entire community."

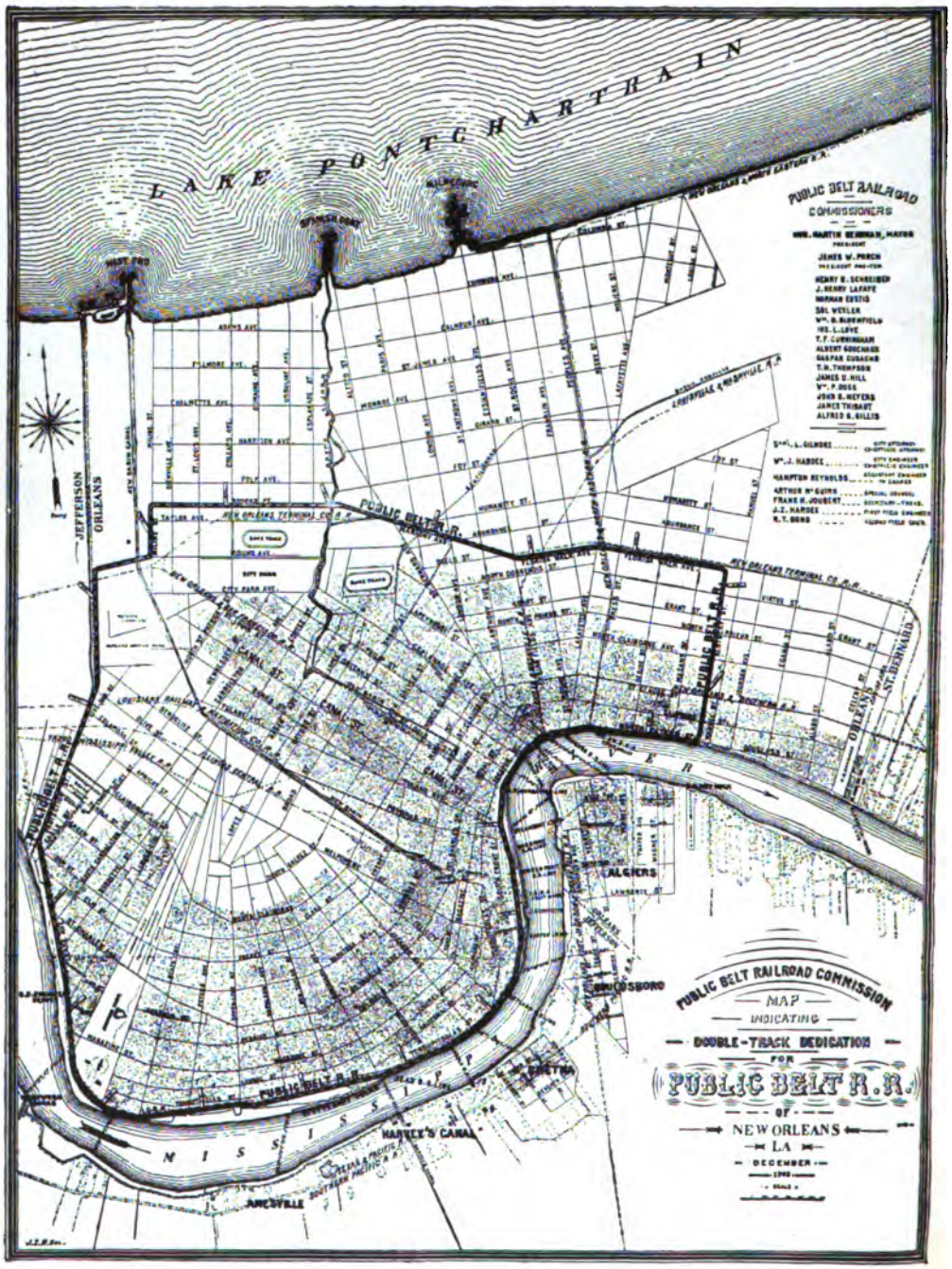
New Orleans lies in a loop of the Father of Waters, backing up on Lake Pontchartrain. The great river furnishes a highway from the North for all the products of the Mississippi valley. Alongside the river also run great railroads, leading down from Chicago and the North.

Though located a hundred miles from the Gulf of Mexico, the giant jetties built years ago by Captain Eads so confine the river that its resistless waters keep constantly scoured clean a deep channel, giving easy access for ocean going vessels. At the docks in New Orleans steamers from St. Paul, two thousand miles inland, and rusty cargo boats from Liverpool and Italy may rub noses together.

That these docks may be kept free of burdensome charges, that the gateway to traffic may not be forced to pay a tribute to a private purse, more than seven miles of the river frontage are publicly owned and managed.

Nearly thirty great wharves have been built at public expense, fitted with huge steel warehouses for the storage of goods and with modern machinery for the quick handling of grain, fruit, coal and other products.

But the people of New Orleans have not been content with securing permanent public control of their water front. Equally important with water transportation—more important to local industries—is transportation by rail. And just as railways by favoring one city or one section of a state, as opposed to others, have shown their power to divert and concentrate business prosperity, so have they the power to foster the growth of one section of a city—of one group of industries—at the expense of others. If a big plant has a switching track of its own running through its property, cases have been known where a rebate has been collected by charging the railroads to which freight is delivered a considerable sum for each car handled over the private tracks. And where loaded cars must be switched from the tracks of one road to another before getting started toward their destination there are always likely to be delays and other annoyances.



HOW THE PUBLIC BELT RAILROAD SERVES THE SHIPPING INTERESTS OF NEW ORLEANS.

Prompt deliveries of freight—no matter where it originates—to the desired railroad or the plant of the consignee are essential to healthy business development.

To meet these conditions, to put all the manufacturing plants of the city, as well as all the railroads, on an equal footing, the City of New Orleans has built and is now operating at public expense and under public management a belt line

BELT LINE TRACKS RUNNING TO THE PUBLIC DOCK.

A MISSISSIPPI RIVER STEAMBOAT.
These boats are important factors in the commerce of the Crescent City.

railroad, intersecting all the railroads entering the city—the Illinois Central, the Southern Pacific, the Louisville & Nashville, the Texas & Pacific and the New Orleans & Northwestern among others. The tracks of the belt road also run along the river front, so that a car of freight can be set alongside any one of the publicly owned and operated docks. Connected with the belt road are switch tracks leading to nearly fifty of the largest industrial plants in the city, putting each one of them into direct touch with all railroad, river and ocean transportation.

Up to the present time about eleven miles of double track belt road have been constructed at public expense at a total cost of half a million dollars. The charge made by the belt road for handling freight is two dollars a car, regardless of tonnage and empty cars are returned or delivered free of charge. For the past year the receipts of the belt road have exceeded the expenditures by about three thousand a month.

The belt road already owns a right of way running in a half circle about the city and it is proposed to shortly extend the line, making a total mileage of over twenty-two miles of double track. For the purpose of meeting the construction expense the Commission which has the affairs of the road in charge has authority to issue bonds up to two million dollars.

This Commission is made up of the mayor and sixteen other members appointed from the ranks of the leading business men of the city. In practice it has been found easy to get able and public-spirited men who are thus willing to give their time and best efforts for the common good, without receiving a cent of salary in return. The actual operation of the road is in the hands of a trained railroad superintendent, a secretary and an engineer.

The plan of operation is simple. If a shipper along the line has freight to be moved from his factory he simply notifies the nearest belt line clerk, naming the destination of the consignment. Next morning the belt will deliver the proper cars on his siding. When the loaded cars are switched out the shipper receives a receipt from the belt line conductor which is exchangeable at the office of the railroad to which the freight is consigned for a regular bill of lading. When inbound shipments are expected the belt line clerk is notified that certain cars, giving their numbers and initials and place of origin, are expected on a specified date. Within a few hours of their arrival in New Orleans they will be switched into the consignee's side-track. When cars are held up by shippers the belt line pays the railroad which owns them a per diem charge during the delay and collects in its turn from the shipper.

In addition to its primary work of thus offering equal opportunities to all ship-

BELT LINE TRACKS ALONG THE RIVER.

pers to and from New Orleans the belt line road also does other important work for the common good. Located about two miles apart along the river front on special switches connected with the belt are five garbage-receiving stations. Daily the garbage carts deliver their loads to specially-constructed garbage cars on these switches. Being first sprinkled with disinfectants, the garbage is then hauled over the belt tracks to points far out in the swamps, remote from the city, where it is dumped and scattered, the idea being eventually to use the land so filled up for agricultural purposes.

The Belt Commission now has under consideration a plan for establishing a system of public lighters on the river for transferring cargo from incoming ships to any desired dock. In this way it will be possible to avoid the necessity of steamers moving from one dock to another to discharge various portions of their cargoes.

Since New Orleans is located on low ground and since the Father of Waters has a distressing habit of suddenly swelling the flood which sweeps down from the north, the state has protected its metropolis by building great levees of stone and earth on either side of the channel. In the building of these great protecting walls the belt road has been of service, hauling the earth and other supplies for the contractors and distributing it, without change, exactly where it is wanted.

Working in harmony with the Dock Commission and the Levee Board—both state bodies—the Belt Road Commission, appointed by the City, absolutely controls the river front and all its approaches, "for the benefit," as Commissioner Smith says, "of the entire community."

The South is supposed to be the most conservative part of the country. Yet not only has New Orleans set an example of the proper way to handle the great question of transportation, but it has also revolutionized her city government. Quietly and with no great excitement, under the leadership of one of the city papers, it has won a great fight against the old and corrupt gang, which has long had control of city affairs, and this spring it is expected that the administration will be put into the hands of the same class of public-spirited and enlightened citizens who have made a success of the Public Belt Road and other municipal utilities.

Plans are also under way for the organization of several steamship companies which propose to run new lines of boats to Central America and, after the Canal opens, to the thriving ports on the west coast of South America. Public spirit and private enterprise, working together, promise big things for the future of the Crescent City.

SHEDS AND SHOPS OF THE BELT ROAD.

In the good old days before New Orleans woke up, one or two railroad companies practically monopolized the whole river front. They kept out the other roads or made charges, for handling their cars, which were almost prohibitive. The state railroad commission regulated these switching charges, but was quite unable to prevent the annoying and costly delays which constantly resulted. The belt road, under public ownership, was the only way out.

Now, when the Canal opens, New Orleans will be ready to serve as the shipping and transfer point for all the products of the great valley to the north. Trains and steamers from the interior, laden with freight destined for South America or Asia, will find in her belt road and public docks a fair and equal service that offers the same opportunity to all comers. So far as they are concerned, free and unrestricted competition has been restored and the greedy hand of special privilege has been cut off at the wrist.

Thoughts of Marcus Aurelius

¶ A man should *be* upright, not be *kept* upright.

¶ A man's happiness—to do the things proper to man.

¶ What is not good for the swarm is not good for the bee.

¶ Nothing happens to anybody which he is not fitted by nature to bear.

¶ No form of Nature is inferior to Art, for the arts merely imitate natural forms.

¶ "Let thine occupations be few," saith the sage, "if thou wouldst lead a tranquil life."

¶ To a rational being it is the same thing to act according to nature and according to reason.

WORLD AUTHORITY ON LIGHT

PROF. ALBERT A. MICHELSON, Director of the Ryerson Laboratory of the University of Chicago, is the world's most learned and famous physicist, in the department of light. What he doesn't know about light simply is not known. A man, who can take the Nobel prize of $40,000.00 for his contribution to the illumination of men's minds on that luminous subject, stands apart. There are five Nobel prizes, of that same size given each year, making a total of $200,000, the same being the interest on a bequest of $9,000,000.00 left by Albert B. Nobel, the Swedish inventor of dynamite. These prizes are for the most important discoveries or inventions in physics, in chemistry, in physiology or medicine, the best work in idealistic literature, and the best work in the interest of universal peace. President Roosevelt got a prize in the latter department; Dr. Michelson took the prize in 1907 for discoveries in light.

Prof. Michelson is a graduate of the U. S. Naval Academy at Annapolis. He chose an instructorship in physics under the late Admiral Sampson rather than the usual ensignship in the service. Before he was twenty-five he had startled the scientific world by a brilliant research on the velocity of light, attaining such accuracy in the measurement of this important constant that it has been a standard to this day. Considerably later at Case School and again at Ryerson Laboratory he carried out a research on the question whether the ether, which pervades all space and carries light and electrical vibrations, moves with the earth as that body revolves in its orbit; his conclusion was that it does not. That was another striking contribution to our knowledge.

ELECTRIC WIZARD'S NEW WIZARDRY

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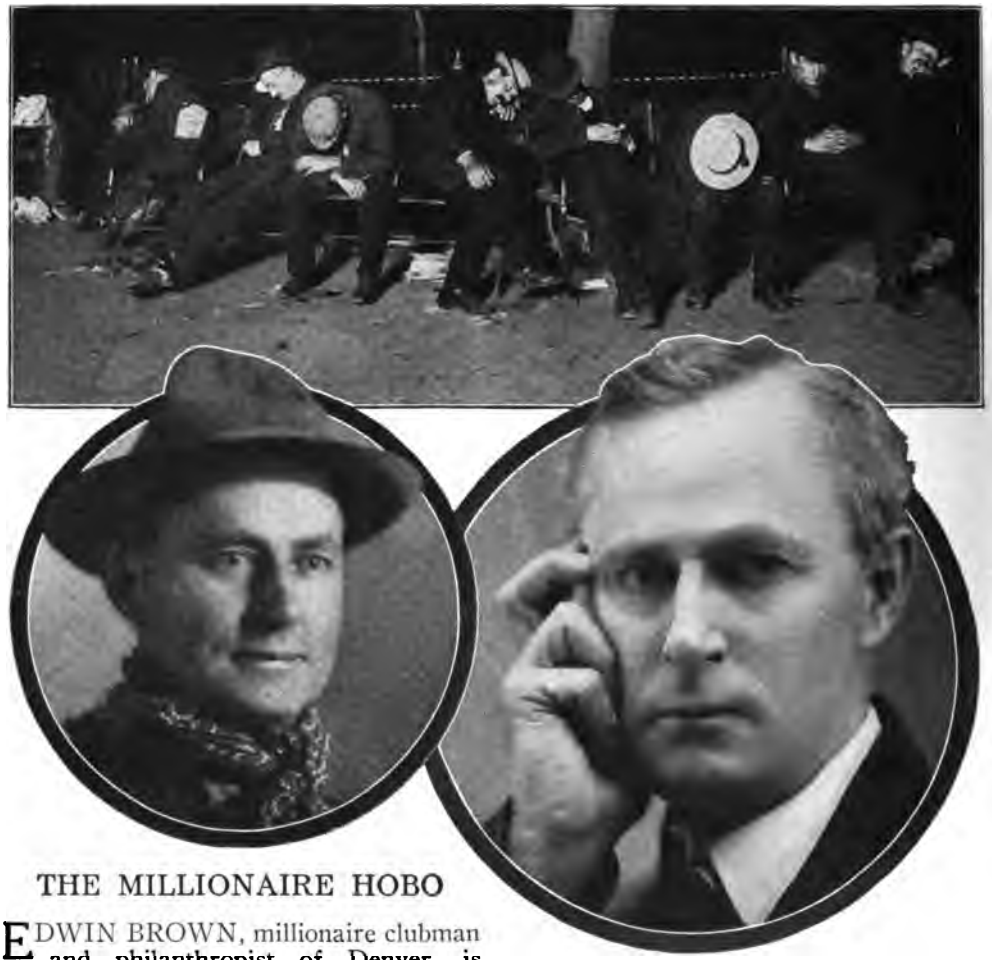
MR. THOMAS A. EDISON tells us that he is going to give us a new kind of furniture, and that we are no longer to depend upon the stalwart oak, the rich massive mahogany, or the finely marked circassian walnut. He's going to build our furniture from concrete direct.

"And my concrete furniture will be cheap, as well as strong," says Edison. "If I couldn't put it out cheaper than the oak that comes from Grand Rapids I wouldn't go into the business. If a newly-wed starts out with, say, $450 worth of furniture on the installment plan, I feel confident that we can give him more artistic and more durable furniture for $200. I'll also be able to put out a whole bedroom set for $5 or $6."

At present the weight of this concrete furniture is about one-third greater than wooden furniture, but Mr. Edison is quite confident he can reduce this excess weight to one-quarter. The concrete surface can, of course, be stained in imitation of any wood finish. The phonograph cabinet shown at the left of Edison has been trimmed in white and gold. Its surface resembles enameled wood. The cabinet at his right is in old style.

This concrete cabinet easily withstood the no gentle usage of shipment by freight for a considerable distance.



THE MILLIONAIRE HOBO

EDWIN BROWN, millionaire clubman and philanthropist of Denver, is known all over the country as the "millionaire hobo," because for a year he donned the garb of a vagrant, took the last cent from his pockets, and started on the road, just to see what sort of treatment a penniless, hungry and homeless man, in search of work, would receive.

He found that in spite of Salvation Army homes and Rescue Missions, there was absolutely no spot in any of these buildings where a man without a cent could lay his head. He had to be arrested even to be allowed to sleep in the "bull-pen," the harboring place of inebriates, dissolute characters and hardened drug-fiends. He was forced to spend the night on a narrow wooden shelf, surrounded by an almost unbearable stench of foul air, listening to the ribald pleasantries, the curses and quarrels of the other inmates.

It is Mr. Brown's idea that the city should provide municipal lodging houses for the accommodation of strangers stranded there and that these houses should be run on humanitarian principles. He believes that in every city except New York, ninety per cent of the homeless men are not real hobos but men out of work. He describes the New York municipal lodging house a model of its kind.

SHE SPEAKS FIFTY TONGUES

IF Mrs. David Brainerd Spooner had been present at the building of the Tower of Babel, she might have rendered good service on that somewhat celebrated occasion. Among all that confusion of tongues, she would have been able to understand 54 at any rate. For Mrs. Spooner is one of the foremost linguists in the world, and understands that many languages. Mr. Spooner, to whom as Miss Elizabeth S. Colton she was married but a short time ago, has almost as great an understanding of world-wide speech as herself.

He is the savant who discovered the casket believed to contain the bones of Buddha, in Peshawar, India, in the summer of 1910, one of the greatest discoveries known to modern archaeology. This casket was presented to the King of Siam. Mrs. Spooner has traveled extensively over the Far East, in India, Egypt, and elsewhere. She belongs to several learned bodies of the Old World. Mithridates King of Pontus in the first century, B. C., is accredited with having been able to speak twenty-four languages, the number of races over whom he ruled. Thus Mrs. Spooner has command of more than twice as many different languages as had this famous and brilliant king of the ancient world.

She has the "gift of tongues" to an extraordinary degree.

WILLIAM R. HARR is ranking Assistant Attorney General at the Department of Justice in Washington. There are three Assistant Attorney Generals and the great bulk of governmental prosecutions fall to the lot of these three. William R. Harr has recently been engaged in two of the federal prosecutions that are of most interest to the ninety millions. These are the tasks of bringing to justice those parasites upon a modern civilization who make their living in the white slave traffic, and those misguided enthusiasts who have sought to further the cause of labor by the use of dynamite.

This first he has so worked out in the last two years as to guarantee an ultimate federal card index of all members of the underworld so arranged that the federal government will always be aware of the movements of all of its members. Yet these cases are but a part of the work of Mr. Harr. Great numbers of cases come to him from the different departments. He handles, for example, all peonage cases, immigration cases, violations of the national banking laws, and many others. Mr. Harr is thirty-nine years of age. But a few years ago he was a stenographer and before that a printer. He is a native of the District of Columbia and has never cast a vote and has no constituents. His advance has therefore been entirely aside from politics. His case is, in fact, an instance of the opportunity the government service offers to those young men, who have only their own native ability and inherent good sense and judgment to further their advancement.

As a prosecuting attorney, Mr. Harr is shrewd, resourceful, thorough, and untiring. He can as quickly uncover the flaws in the defendant's case as a fox would scent out a hen-roost.

He is just at the age where a man has not lost his youthful enthusiasms, and yet where his judgment begins to be tempered by his experience. At once tactful and aggressive, untiring and resourceful, Mr. Harr has forced recognition of his abilities.

WILLIAM R. HARR, OF THE DEPARTMENT OF JUSTICE, NOW RANKING ASSISTANT ATTORNEY GENERAL.

THE SCOURGE OF THE AFRICAN JUNGLE.
The tsetse fly (*Glossina Palpalis*) that spreads the terrible sleeping sickness, for which there is no cure.

FATAL PLAGUE THREATENS WHOLE WORLD

By

DAY ALLEN WILLEY

LAKE VICTORIA with its cluster of islands is still to the eye a paradise of the Dark Continent. When the traveler through the framework of forest gets his first glimpse of it, he sees a marine landscape in which the wave tops seem whiter if anything than the new fallen snow, far whiter than the wave crests in mid-ocean, because they rise and fall in a sea of turquoise finer and more brilliant than the blue. The Sesse Islands in this lake are a specimen of Nature's jewelry. "Studded" best expresses the way in which they have been set in Victoria, like emeralds, with their crowns of verdure in bush and tree, of a green so pure, so real, that the first sight of it makes a picture never to fade from the memory.

The nearer view of the Sesses makes you instinctively think of the voluptuousness, the abundance of the earth, so large and so perfect are the flowers, so very lavish is the profusion of tropical adornment—not a sign of sorrow, a picture all life—all peace reflected in the rays of the African sun. But the Sesse form a charnel. Death is upon them.

This is a land of silence. The laugh of the child is unheard, the chant of Baganda women so full of cadence comes no more over the waters. The bark hut villages that for centuries sheltered the finest types of the African races are rotting ruins. Hyenas prowl in the jungle-covered fields where the banana and cotton once flourished, while the birds of variegated plumage—the African birds of paradise—flit here and there amid the groves.

Why this desolation, this absence of all that is human? Because of a fly which carries in its beak the thing that is the tiniest murderer known to the world—a murderer that never fails to kill its victim—whose life means certain death wherever it lives. The men with the microscope who can tell you of the birth, the growth, the habits and the danger or benefit of a microbe or parasite, the

world's greatest experts in knowledge of disease-breeding and disease-preventing, have gone into the African jungle

A Month Before Death—The Third Stage of the Sleeping Sickness.
The victim has not the strength to hold up his head.

In the Detention Camp Established by the British Authorities.
These three patients cannot move their limbs.

and swamp to find some way by which this invisible man killer may be driven from its victim's body. Years have they been working with every scientific appliance known and every drug that might be efficacious, but today they have found no way to prevent this insect from injecting the death-dealing parasite into the human blood.

Yellow fever has lost the mystery of its origin. The tiny worm that causes the "laziness" of the poor white of the South can now be shown on the lantern screen attached to the intestinal walls and sucking blood. This is revealed by the microphotograph. Many germ diseases have been brought under partial or entire control. The exact cause of tuberculosis is now known; yellow fever has been subdued by destroying the mosquito; the hook worm can be destroyed by medicine, but this African death thing has a charmed life. It has wriggled through the arteries of a half million people, not only black, but white. On and on it goes, further and further into the body by the blood canals, until eventually it arrives in the spinal cavities. The surgeon's needle has drawn the spinal fluid from thousands of sleeping sickness suspects, also tapped the arteries. Sometimes not a trace of the thing could be found in the blood—but floating in the spinal ducts millions of them were actually discovered by the power of the microscope.

Out of a hundred thousand negroes living in the Sesses less than a thousand were left on the islands alive when the British medical service took charge of them, and sent them to the detention camps which the British colonial doctors

had established on the mainland beyond the fly zone, to confine the spread of the disease. Blood and back-bone tests were made of every inmate, the work requiring months. None of the Baganda seemed affected, judged by their appearance—but this parasite works in secret. Nearly half the natives were stricken.

England's Sleeping Sickness Commission is in Uganda. That is why the trypanosome, as science calls it, is supposed by the outside world to be limited to a small part of Africa, because the reports of the Commission refer only to the curse in the British African colonies. But here is what the men who have been following its advance have found—men who have traced it half-way around the world. Guerin, the famous Frenchman, located 148 victims marked for death among the blacks of Martinique, in the West Indies. Steamers ply regularly between this island and New York City. Two white passengers on a steamship running between the Congo River and London, were taken sick on a return voyage of the vessel. The ship's surgeon treated them for African fever, but without any effect. They were taken to the Charing Cross Hospital on arrival at London. As luck would have it one of the hospital staff had been in service at a detention camp. He noticed a sign of the disease—neck glands swollen. To make sure, he drew some blood from each. The lens showed it to be alive with trypanosomes. Both victims died within six months after reaching Charing Cross.

For over a thousand miles up the Congo River steamers manned by Belgian officers go up and down from the coast, getting cargoes for ocean liners that discharge at European ports. The native crews of the boats help unload the cargoes on the steamships and mingle with their crews. Such noted experts as Nabarro, the Frenchman, a world authority and student of sleeping sickness, doctors Dutton, Todd, and Sir David Bruce have all been in the Congo region and have found that much of it has been desolated by the sleeping sickness. Yet the fly which carries the disease has been found at all the river landings and many of the negro cargo handlers are known to have been bitten by it. The fly can easily conceal itself on vessels for European ports, as it lights on the Congo canoes and other small craft carrying rubber to the sea coast. What it may mean to the world, considering the way in which it can be distributed, is shown by this warning from Doctor Nabarro: "There are several species of flies that *may* propagate the trypanosome, and the possible results of the infection both in Africa and out of it are too appalling to contemplate." And here is the startling predic-

LABORATORY FOR THE SCIENTIFIC STUDY OF THE SLEEPING SICKNESS BEING CONSTRUCTED BY NATIVE LABOR AT MPUMU, IN THE UGANDA COUNTRY.

tion of Sir David Bruce, one of the pioneers in the war of medicine against sleeping sickness, who has chanced death for years in his devotion to what is his life work.

"While so far it has claimed comparatively few white victims, not only do the blacks become infected, but all who get it, die of it. Can the civilized world realize what terrible sacrifice of human life might ensue if the sleeping sickness should contrive to steal across to European, American, or Asian shores? Such disaster is not impossible and is proved by the fact that often cases have not developed until months after any possibility of infection, and by further fact that it is not yet definitely known that the mosquito or some other flying insect than the tsetse may not communicate the disease. If the world knew what we know, scientific columns would be hastening to the front from all the Great Powers bent on a joint assault of the enemy before it was too late."

THE COURAGE OF THE WHITE RACE.
Sir David Bruce, an English scientist and fighter of the sleeping sickness, in one of the breeding places of the tsetse fly, with face and hands unprotected from its bite.

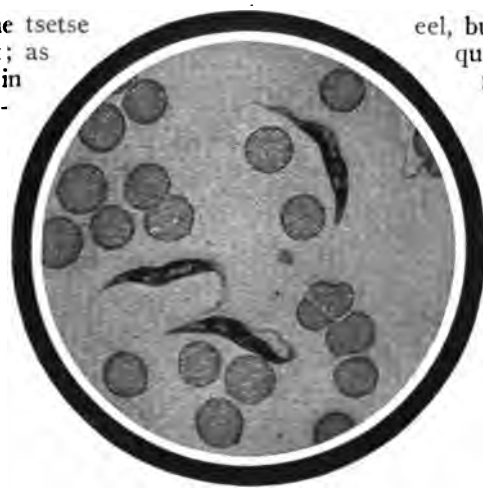
Not only Bruce, but Nabarro, Todd, Koch, Hodges, Kopke, Martin, Hardy and Klein, and other world-known medical savants have taken the death chance and are among the little band on the very front of the fighting line, hopeless as yet of relieving the victims of the trypanosome, but struggling to prevent further inroads on mankind.

Nabarro can well say what he does, for no other man of science has found the disease in so many places in Africa or has so awakened the whites of that continent. He has devoted most of his life to trying to conquer the invisible thing — a fight which has showed his remarkable courage —for to discover a remedy he must spend years in the region now known to be deadly to black or white. He has gone into the worst plague spot of the infested Africa, the Congo Free State, from whence came the death fly to Uganda, when Emil Pasha's Soudanese soldiers, corrupt and diseased, entered the country and left a trail of fire and blood behind. Worst of all, however, flies, traveling with the caravan, infected the people and the rapid spread of this latter curse caused more permanent harm than the immediate ravages of the vandal horde.

As yet the investigators have not found where the Soudan negroes caught the complaint. Most of them think it was in the Congo, and had good reason for it. When the would-be life-savers came to enter some of the towns, in the Congo Free State, they found every native, to the youngest child, helpless or dead, as was the case at Bouma and Tombo. In the country south as far as St. Paul de Loando their

THE COMPLETED LABORATORY AT MPUMU.

report shows that the tsetse fly is doing its work; as is also the case in Senegambia and Upper Guinea. Even Liberia, that republic which was to be the Mecca of the American freedmen, is infected, while the thing has been carried to the Atlantic at the Gold Coast, and finally penetrated several white European colonies in Africa. It has killed off the population on the Congo River from the towns of Kassai to Bolobo, a distance of 750 miles, and for 250 miles the country traversed by the Bambia River has been left desolate. The half million deaths in Uganda are but a fraction of the number of victims as sleeping sickness has been found in an area reaching 1,500 miles north and south and about the same distance east and west.



ENLARGED MICRO-PHOTOGRAPH OF THE SLEEPING SICKNESS TRYPANOSOMES, OR PARASITES, SWIMMING AMONG THE CORPUSCLES IN THE BLOOD.
The bite of the tsetse fly injects these parasites into the system, and thus the fatal sleeping sickness results.

In a drop of human blood may be darting hither and thither thousands of trypanosomes. This means death in six months, a year—perhaps longer, but the end is sure after trypanosomes have been forced into the body as the fly carrier injects them into the hole first bored through the skin. The wonderful vision of the lens has caused the eye to see them in life though the size is so small as to be beyond calculation. This fatal parasite looks somewhat like a fat-bodied eel, but lightning can be no quicker than its swiftness.

The flies that make the attack have a boring tool sticking out from the head. Its point is rounded like a miniature cigar and connects with the mouth. After a fly has taken its deadly food, by biting rats, snakes, lizards, and wild animals—even crocodiles—and infected negroes, its mouth and stomach holds a mass of trypanosomes. Lighting on the skin so softly that the victim knows nothing of its presence unless he sees the fly, it pierces the skin with its borer. The wound is so trivial that it inflicts no pain. Through this the trypanosome passes into the body. Once inside it works its way into the nearest artery. It then breaks into halves and two of the parasites have taken the place of the one. Both divide again and again so it multiplies until over a million may be churning the blood and the liquid that surrounds the spinal cord, within twenty-four hours after the fly has bitten. These human reservoirs of trypanosomes become spreaders of the disease if a fly again feeds on them, and it is believed that any winged insect which may pierce the skin, the mosquito, for instance, can extract these death-dealing parasites, and thus the disease may spread to an untold

AWAITING DEATH IN THE DETENTION CAMP AT KYETUME, UGANDA.

extent, as Bruce and Nabarro have predicted.

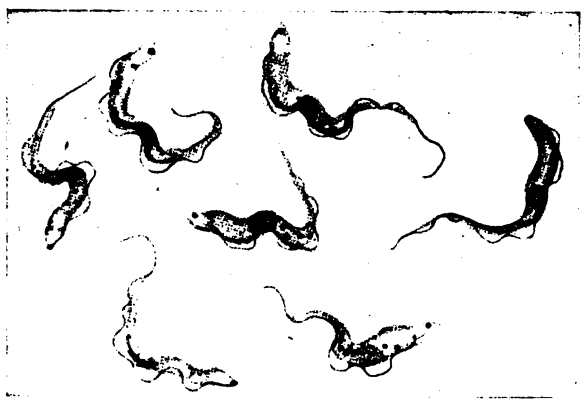
The doctors have forced arsenic into the blood of the victims and they have disappeared. Some may have been poisoned, but after a month or so, not longer than six months, the blood tests show that they are again at work and as numerous as before if not more so. No other remedy save arsenic has had any effect whatever, and that is only temporary. England, Germany, Belgium, France have sent their most noted disease experts to stay the plague. Dr. Seaman, our own authority on yellow fever, who, to prove his mosquito theory, slept in beds where victims of the fever had died the same day, has also been through Africa's morass and jungle and risked his life, but today he admits that not one thing known will kill all these parasites after they have entered the body of man. The physicians, the bacteriologists are as far away from removing this curse upon humanity as they were when its ravages were first discovered.

WHERE THE DISEASE IS RAPIDLY NEARING THE END. Note the look of patient despair on this negro's features. He is absolutely helpless, for he cannot stand or change his position without aid.

The black man is the happiest of human beings. He lives on life's sunny side, for he does not know what sorrow and trouble mean. Singing is as natural to him as eating and the harder he sings, the harder he works. On the banana plantations in southern Africa, he makes a sound, harsh, weird, but it is his music. When a negro is silent it means that something within is wrong. This was one way in which the doctors found the sleeping sickness where there was no other sign. When the song stops he seems to get lazier and lazier. His vigor has gone. As he walks he staggers. After a while he may crawl, no strength in his legs to support his body. Now the neck glands stick out against the skin swelled with the parasites, his eyelids half close over the dimmed eye balls. He is a picture of a human being turning into an unnamable thing, and as he grows weaker and weaker, the face becomes more and more distorted. You see hatred, sullenness, the glare of a wounded wild beast in it. That wriggler in his blood, unknown to him, is slowly deadening brain as well as body. More and more he becomes like a chained animal in his contortions and struggles. The stronger the victim the longer he resists, but finally his efforts cease. Limbs and arms are bent at the knee and elbow and become rigid. The dull, fixed, half-closed eyes have no movement and their stare gives a horrible expression to the

TAKING THEIR LIVES IN THEIR HANDS TO CATCH THE TSETSE FLY FOR PURPOSES OF EXPERIMENT, ON THE SHORES OF LAKE VICTORIA NYANZA.

face. Inside the body is life,—the heart is beating, the stomach can digest food, but the outside is dead. The invisible murderer at last has entered the spinal canal and has multiplied in it. Paralysis has the victim in its grip. But months, even years may pass and still the heart beats, though the thing is blind, dumb, immovable. It has no pain. It has no feeling. A torpor has enveloped it. Not a sound can it utter. At last the death sign comes. The head of the patient—who is generally propped up against a wall or post—bends forward, at first only an inch or so. The neck muscles are weakening. Lower it falls until the chin rests on the breast. The heart beats fainter and slower—and stops. The trypanosomes have finished their work. He is a cadaver—infected with the parasites which have killed him, and a thing of death should the tsetse bore into the body. Cremation or burial occurs at once.



ANOTHER GREATLY ENLARGED MICRO-PHOTOGRAPH OF SLEEPING SICKNESS PARASITES.
They resemble "fat-bodied eels."

The tsetse looks like our house fly that has been accused of so many crimes. In appearance it is harmless. Blood is the food of the fly and it makes no difference what it bites. On the Upper Nile, Dr. Nabarro saw crocodiles sunning themselves. Upon the blood filled flesh lining of their open jaws were sucking swarms of tsetses. This fact is believed to have been settled: no fly causes death unless it has bitten an animal or man infected by the parasite, but it has a variety of prey to feed upon. Eight species of tsetses spring from larvae buried in the mud banks of streams. The one that menaces human life is the *Glossina Palpalis*. The animal killer is the *Glossina Morsitans*. When they have sucked the blood filled with trypanosomes, they may have enough to last them sixty-six days. During this time, man, woman or child, or brute on which it lights, may become its victim. It lurks in the grass and flowers of the swamp, will fly sometimes a hundred miles in a day as shown by tracing one. The Palpalis has been found and killed in cars on trains on the Uganda railroad which reaches from Lake Victoria 500 miles through a thickly settled part of British Africa, proving the predictions of those hunting for it that no one knows today where it may go, as its larvae de-

THE TSETSE FLY IS BELIEVED TO SECURE THE FATAL PARASITE BY FEEDING ON THE CROCODILE AND OTHER ANIMALS.

STUDYING THE TSETSE FLY AND THE PARASITIC TRYPANOSOMES UNDER THE MICROSCOPE IN THE LABORATORY OF THE AFRICAN COMMISSION.
The head official of this Commission, Sir David Bruce, is seated at the left.

velop in any tropical morass that may chance to be at hand.

A PORTION OF THE LABORATORY SCREENED OFF BY MOSQUITO NETTING.
In the foreground is shown a box for hatching out tsetse flies for experimental purposes.

Here and there in western Uganda far enough away from the death carrier's haunts to be free from the fly's visits are charnel houses whose dark walls shut off from view the tragic scenes produced by this curse to human beings. They are the detention camps where the "suspects" are herded after being brought in droves, sometimes at the bayonet's point, where they may be obstinate, to be placed where they cannot infect others. Before being placed in these thatched sheds, the surgeon's needle pierces each and fills the test tube with blood on which the lens of the microscope must pass judgment. If even a single parasite is detected the negro is condemned to confinement for life. He can go outside if able, walk or sit as he wishes. But there is a dead line where are posted black men in khaki and puttees, Uganda native guards, drilled to handle the rifle. If one of these prisoners for disease in his frenzy attempts to pass between those living statues he is seized and forced back. If he should get outside, the blacks obey their orders, but this death is a mercy if the victim had the intelligence to know it. Thus the spread of the disease has been checked, at least in Uganda,—though, nevertheless, thousands of lives have been lost,—by separating the infected from the healthful. All the blacks have been taken

away from the swamp huts where the winged death might reach them and shelter given them on high and dry ground where the fly is unknown.

The captives in the detention camp, the monkey huts, the rat cages, the dog houses, provide means of studying sleeping sickness by which many of the facts known of its curse to human beings and animals have been revealed. Risking their lives the members of the fly expeditions search swamp and water shore where the rank tropical vegetation shelters their prey. Provided with long handled nets, as a tsetse fly takes wing, the net is dropped over it and given a twist. If wanted dead, it is picked out with the gloved fingers and the head put into a bottle of poison, the fly put into a covered tin box for laboratory work. But the alert negro is quick enough to catch them alive in the bush, sometimes without a net, using one finger and the thumb to grasp the wings. These fly boys are at each detention camp and also wear the khaki and puttees, but go after the winged death carrier with faces and hands bare, laughing and jumping as if having a frolic. They know the habits of the fly as the American boy knows the bee, but ignorant of what a bite may mean. Several have been bitten but merely because they had become careless.

In this way collections of biting flies are procured from all parts of Uganda. As each package comes in, it is examined for tsetse flies. If the parcel contains man killers, a red disk is stuck on a large map over the locality from which the flies have been sent. If, on the other hand, no tsetse flies were found, a blue disc is fixed over the spot. In the same way and at the same time a second map is prepared, to show the distribution of sleeping sickness. If a note accompanying the collection of flies states that sleeping sickness is prevalent, then a red disc is placed over the locality, and if, on the contrary, no cases of sleeping sickness are reported, a blue disc is affixed. Thus the two maps so prepared show at a glance whether the distribution of sleeping sickness and that of the tsetse correspond or not, and the map warns against the infected regions.

The tsetse, dead or alive, is made an agent to aid in finding a cure for the

INCINERATOR FOR DESTROYING ALL REFUSE IN THR DETENTION CAMP.

LABORATORY WHERE MONKEYS, RATS AND OTHER ANIMALS ARE PERMITTED TO BE BITTEN BY TSETSE FLIES.

This experimentation shows how the disease takes effect. The monkeys are kept in the boxes on the posts.

fatal thing which it carries. The dead go to a dissecting stand where the microscope reveals the number of trypanosomes each have in the mouth, if they are infected. Larvae collected are hatched in a curious incubator and the changes observed up to the time they become full grown. To prove its ability to do its murderous work, the fly developed is fed on a drop of infected blood and placed

NATIVE UGANDIANS OUT SEARCHING FOR TSETSE FLIES TO TAKE BACK TO THE AFRICAN COMMISSION OF SCIENTISTS.

BREEDING SPOT WHERE LARVAE ARE DEPOSITED BY THE FLIES.

SEARCHING FOR LARVAE ON A SANDY BEACH.

on a monkey to bite him. Once is enough. Blood tests soon show the wriggler in the blood of the animal. He can be counted as dead. Before dying, other flies are put into the monkey box to suck his blood, then taken to the dog house or the rat cage to discover if they are infected. The animal victims may show no outward signs, but again the blood tests reveal the deadly truth that the tsetse can carry its invisible death-dealing parasite from an infected animal as its source.

The rat may easily be a source of the disease. While a British surgeon's orderly was cutting open a rat that had been bitten, the point of his knife slipped, merely scratching the skin of his wrist. The others rushed to his aid. A comrade put his mouth to the spot and sucked out what blood he could, spitting it out instantly and washing his mouth with an antiseptic. The surgeons cut the tiny artery under the knife scratch and tied it in two parts to check the movement of the trypanosomes, then cauterized the wound. In a week the lens revealed them in the blood test. In six months the man was a corpse.

Only by such near-death work is it possible to form any conclusion as to the origin of sleeping sickness or nagana as it is called when the horse or cow or antelope is attacked by the tsetse, and horrible as it may seem the poor wretches in the detention camp have been subjects for experiment. This on the face of it would appear to be a horrible cruelty, but it is necessary for the benefit of humanity. Tsetse flies, free from trypanosomes, are placed upon victims in various stages to determine if they can absorb the parasites. After they have sucked human blood they are put in the cages and huts where the captive animals are confined. In nearly every instance the trypanosome is found to have performed its mission of death.

Sir David Bruce, who has made a life monument to himself for his fight against this destroyer, utters these words: "Can we by any means kill the trypanosomes in the body of man, or render man immune to the attack of this parasite? Can a drug be discovered which will cure man of this disease? Many attempts have been made, and are being made, to discover such a drug. As long ago as the days of Livingstone, arsenic was vaunted as a cure of the 'fly disease,' and up to the present time this drug has held its own as probably the most useful one we have in this malady. At first it was used in the form of arsenious acid, dissolved in an alkaline solution, but later other preparations, such as atoxyl and orpiment, have been experimented with. These experiments have in many cases, been made on the lower animals, and some have doubtless been followed by a complete cure. But

up to the present there is no single instance of a cure effected in man, although thousands of cases have been treated. Experiments have shown that these parasites seem to completely disappear from the blood a few hours after a dose of one of these drugs; and the effect of the treatment seems often marvelous, the patient regaining the appearance of health in a remarkably short time; but eventually the trypanosomes always return to the blood and the man dies.

"All attempts to render man immune to the trypanosomes by some antitoxic serum or vaccine have up to the present been fruitless, and there does not seem to be any likelihood of anything being found out in that direction for a long time to come."

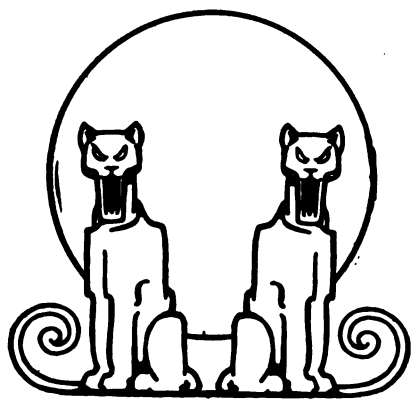
The program of work being carried on by the medical commission is so extensive as to make it impossible to mention every item. Special endeavors are being made to cultivate the microbe from the blood of infected animals in order to ascertain whether the filtered blood of infected animals is able to transmit the disease. The biology and habits of the tsetse fly as well as its distribution and relation with the various trypanosomes are being studied in detail.

Moreover the striking fact that some species of animal are susceptible and others immune is under investigation. According to Todd's theory the answer to this will be found in the enlarged glands.

Another point to be brought out is how far the mental diseases found among natives are cases of sleeping sickness. Koch's hypothesis that sleeping sickness can be transmitted also by contact, etc., is to be examined most attentively.

Atoxyl treatment as applied by Koch (partly alternating with mercury and antimony treatment) is being continued and studied most carefully.

ONE WAY IN WHICH SLEEPING SICKNESS IS SPREAD.
The tsetse frequently bites these carriers—unknown to the victims—while the latter are on the march from one town to another.



THE BLUE SKY LAW

By

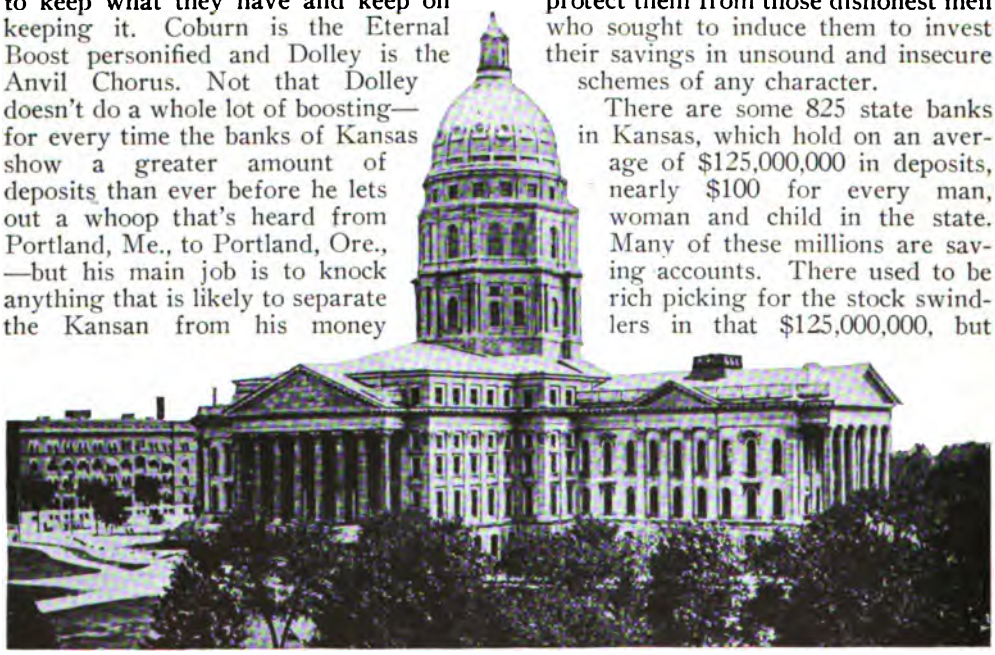
HARRY F. KOHR

IF the men who have been making a living, and something more, by swindling ignorant investors out of millions of dollars have noticed a considerable falling off in business this year they can blame it all on "Joe" Dolley of Kansas. Dolley, perhaps, is not so widely known as Coburn of Kansas and never may overshadow the Premier Press Agent of the Peerless Prairies of the Sunflower State, but he is rapidly attaining a fame that, even if it doesn't dim the effulgence of the Coburn prosperity smile, at least, will not be dimmed by that same effulgence.

Coburn's duty is to tell the populace of Kansas how to keep on making more money. Dolley's duty is to tell them how to keep what they have and keep on keeping it. Coburn is the Eternal Boost personified and Dolley is the Anvil Chorus. Not that Dolley doesn't do a whole lot of boosting—for every time the banks of Kansas show a greater amount of deposits than ever before he lets out a whoop that's heard from Portland, Me., to Portland, Ore., —but his main job is to knock anything that is likely to separate the Kansan from his money without said Kansan getting therefor full and complete value in hand, to say nothing of at least six per cent dividends thereon thereafter.

If you do not already know it, it will be written here that you may read, that Joseph N. Dolley is the state bank commissioner of Kansas, and the first man who ever held the job that anybody outside the state ever heard of, becoming thus widely known because he considered he had other duties than those specifically set down upon the statute books. He held to the view that, if the law didn't say so in so many words, it meant that he was not only expected to protect the people against dishonest or insecure depositories for their money but also to protect them from those dishonest men who sought to induce them to invest their savings in unsound and insecure schemes of any character.

There are some 825 state banks in Kansas, which hold on an average of $125,000,000 in deposits, nearly $100 for every man, woman and child in the state. Many of these millions are saving accounts. There used to be rich picking for the stock swindlers in that $125,000,000, but



WHERE THE INHABITANTS OF THE STATE OF KANSAS ARE PROTECTED AGAINST STOCK SWINDLERS.
The state capitol at Topeka.

there isn't any more, not since Dolley got on the job as bank commissioner.

Mr. Dolley is a banker himself. Born in Boston in 1861, he has that natural New England aversion to seeing money wasted. Much of his early life was spent at sea with his father, an old-time skipper. Tiring of the sea he got as far away from it as possible by going to Kansas. From a clerk in a country store he advanced to proprietorship and then into banking and still is interested in several financial institutions. Incidentally he has managed several political campaigns in Kansas, so that he is used to hard knocks, and whatever the stock swindlers say about him will not hurt him as much as it might hurt somebody else. As a matter of fact, it doesn't hurt him at all. He rather enjoys it, because he always has the last laugh. That last laugh, as it were, is known out in Kansas as "The Blue Sky Law." To describe it in a nutshell, the "blue sky" law confers on the bank commissioner almost autocratic powers in saying whether any stock company may offer its stock or bonds for sale in Kansas.

JOSEPH N. DOLLEY, STATE BANK COMMISSIONER OF KANSAS.
He protects the people not only against insecure depositories, but—through his own initiative—against unsound and dishonest investment schemes as well.

While Mr. Dolley actively was in the banking business, several instances came to his notice where trusting widows had been beggared by putting all their money into fake investment schemes. After he became bank commissioner he heard of many others. He began a systematic investigation and he found that the people of Kansas were being swindled through the purchase of immense quantities of stocks and bonds in unreliable and unproductive concerns and corporations.

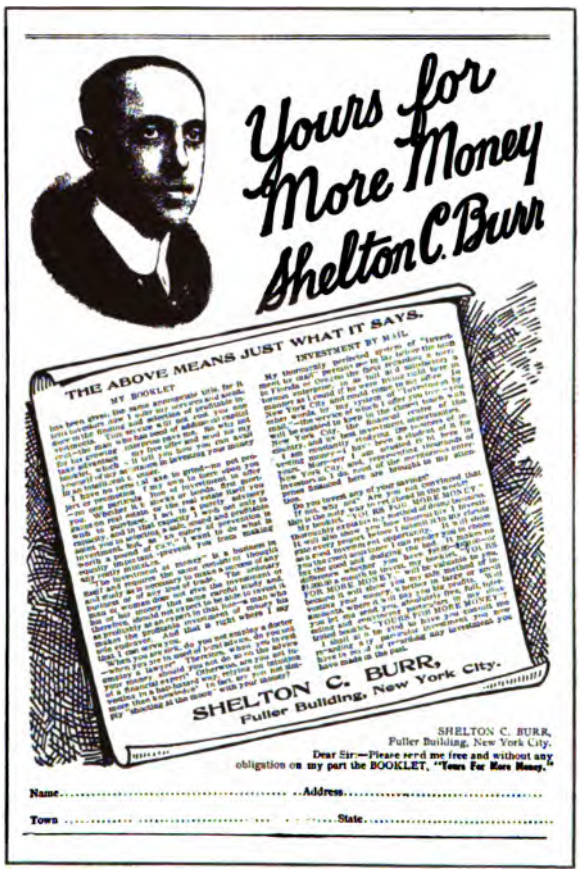
"It is impossible," Mr. Dolley said in a report to the legislature, "for me to advise you accurately as to the probable extent the people were and are being swindled each year by these fakers—and I wish to say, in the great majority, common thieves—but I am thoroughly satisfied that they have been robbed of from $1,000,000 to $3,000,000 a year. In fact, I am inclined to believe that it far exceeds that amount. I find that there is an army of agents representing these concerns working all over the state.

"They especially prey upon widows and the beneficiaries of insurance policies, calling upon the beneficiaries shortly after the funeral and offering to sell them stock which they assure them will pay enormous profits, in many cases promising to pay as much as forty or fifty per cent a year. Ninety-eight per cent of the money so invested by the Kansas investor is absolutely lost."

Here is a case in point:

In a certain town out in Kansas, a woman nearing middle age bends over a washtub six days in the week in a little shack at the edge of town rubbing herself into a premature grave to provide a living for herself and three children. Just a little more than a year ago the husband—a railroad shopman—died, leaving her a pretty little cottage half-paid for, $2,000 in insurance and a little ready money which paid the funeral expenses and left a few dollars over. She was just the ordinary type of a woman, a good mother and a good housekeeper, who grew up in a country town with little opportunity to learn much about business affairs.

One morning, a week or so after the husband's death, the clerk of his lodge went to her home and paid over to her a check for $2,000. Meantime, she had sought advice from the secretary of the building and loan association which held the mortgage on her house. He advised her to pay off the loan and invest the remainder in stock in the association which, he said, would pay her at least



A SAMPLE OF THE LITERATURE BY WHICH AMERICAN INVESTORS HAVE BEEN SWINDLED OUT OF MILLIONS OF DOLLARS.

five and probably six per cent on the investment.

"It isn't much," he said, "but it will be absolutely safe. Perhaps I can find something later that will be just as safe and bring you a better return."

That very afternoon the widow had planned to go to the secretary's office, pay off the loan and invest her money. Then, as the secretary told her, she would have her house rent free, an income of $5 a month and probably she could find something to do that would bring in enough more money to keep her and the children comfortable. She had sent the children back to school for the afternoon and was getting ready to go down town when there was a knock at the door.

The caller was a well-dressed stranger. He introduced himself as Richard J. Tompkins of the Pan-American Plantations Company. By a happy chance he had belonged to the same order as her husband and hearing of her bereavement had called to offer condolences. He had known him slightly—from what he had hastily conned from the newspaper notice of his death—and he was a fine fellow and all that. In fact he had shown some interest in the Pan-American Plantations Company. Sorry he had died because he probably would have invested in what would have been an immensely profitable venture. And so on for a half hour or so until Mr. Tompkins casually mentioned that it was unfortunate small investments at home brought such small returns. Now, for instance, he was not exactly a rich man but he was putting every cent he could make into Pan-American Plantations stock and counting upon being a millionaire shortly.

All of which was calculated to — and did — impress the widow, ignorant of such things and oh, so eager to keep up a good home for her fatherless little ones! She listened, fascinated, to the glowing description of the almost unbelievably rich properties of the Pan-American Plantations Company, her eyes bulging as the suave Mr. Tompkins discussed probable fifty per cent dividends in the near future. Why that, she saw, would be enough to pay off the mortgage and keep the family, too. She could stay at home and care for her children and never need to worry about the future!

Yes, indeed, that was the very thing Mr. Tompkins was leading up to; with the result that Mr. Tompkins carried away with him a very common looking check that was worth $2,000 at any bank in the country and left behind him a beautifully lithographed certificate for 2,000 shares of Pan-American Plantations stock that wasn't worth what it cost to have it printed. An accommodating bank cashed Mr. Tompkin's check and an accommodating railroad carried him out

of town half an hour later. He hasn't been back since, and doubtless never will be.

That is just one instance of the downright thievery that has been, and still is, practiced in this country in the sale of stocks for investment. It is a somewhat aggravated—but not exaggerated—case, but there are thousands and thousands of others, differing only in detail, scattered up and down the United States, and thousands of Mr. Tompkinses busily engaged putting more trusting widows into the hand laundry business. So long as the law maintains a passive attitude toward the Mr. Tompkinses and their business, so long as the "blue sky" lasts—and the supply is illimitable—Mr. Tompkins will be right on the job.

THE BURR BROTHERS—WHO GOT INTO TROUBLE WITH THE UNITED STATES POSTAL AUTHORITIES FOR VERY DUBIOUS STOCK SELLING SCHEMES—UNDER ARREST.

Now, perhaps, you will say you sympathize with the widow, but of course, it was her own fault. She had good advice and didn't act upon it. What can you do about it?

Why stop it, of course! If you advise your neighbor to insure his house and he neglects to do so, and it catches fire, do you stand by and watch it burn? Certainly not! You call out the fire department. That's what Kansas did. It called out the fire department. When it saw its people being robbed right and left it called out the fire department, figuratively speaking. That is what every other state will, or ought, to do. Funny how simple are the solutions of these intricate problems. Just stop it. That's all. Put a penalty on such outrageous thievery and stop it.

If you will sit down with the figures, you will find with little difficulty that in the last ten years the people of this country have been swindled out of one billion dollars in fake investment companies. That is a conservative estimate. Bankers, postoffice inspectors, legitimate investment brokers and Federal district attorneys to whom I have talked say the figures for the last ten years will run nearer three billion dollars. And mind you, this vast sum, somewhere between one and three billion dollars came, in the majority of cases, from persons who could not afford to lose it. I place the estimate low, because I have excluded from it the "suckers." A "sucker" properly is one who knows very well that you can't get something for nothing and yet who risks his money in the fond hope that he is going to beat the other fellow's game. It never has been done and never will be—not in the fake investment game.

The people who bought these worthless securities were not "suckers." They just didn't know. They are honest and unsophisticated, knowing little of business affairs—especially so the women—and ready, as they were with their equally honest neighbors, to take each man at his word. When the well-dressed, ready-speaking stranger came among them and painted glowing pictures of the easy road to affluence through investment of their savings, they took him at his face value—and bought at enormous cost the bitter experience of being swindled.

For the "suckers" there needn't be any sympathy. The ones who should have that, and the ones who need protection, are those who have lost and those who will lose through ignorance. Of course, no one should be ignorant, but since it is "a condition and not a theory which confronts us," we will have to put aside academic propositions and consider prac-

tical things. When men and women have toiled for months and years to lay up a few dollars against a rainy day, both the state and the nation should see to it that, beyond question, they have a safe place to put these savings.

Bad as it was, the Louisiana Lottery never took from any state one-fiftieth of the money that has been taken by peddlers of worthless stocks and it actually did distribute a large share of what it took in. One may even say in comparison a good word for the loan shark, too, even if he does exact his pound of flesh. Yet the nation, the state and the Church rose as one to drive the lottery out of business, upon the loan shark society wages a relentless war. The policy gambler is hounded through the slums and the alleys and some people would like to brand the food adulterator as a criminal. But the king of all the swindlers, the man who sells worthless stocks, occupies the finest suite in the most expensive skyscraper and goes about his business with the sufferance, if not by the protection of, the law.

THE LITTLE CORNER OF MR. DOLLEY'S OFFICE HAS GROWN INTO A NATIONAL INSTITUTION WHICH MIGHT WELL BE CALLED A NATIONAL BUREAU FOR GIVING FREE ADVICE TO INVESTORS.

In every other state except Kansas, the only recourse of the victim is to hire a lawyer and sue for the return of the money invested. But what's the use of throwing good money after bad? Besides, the stock swindler seldom leaves his victim enough money to hire a lawyer. He believes in getting it all while the getting is good.

Suing is too much like locking the stable door after the horse is stolen. The thing to do is to lock the stable door first and then stand guard with a shotgun, in other words to put the swindlers out of business and to keep such a close watch on the other investment companies that there wouldn't be any chance for them to do any swindling. That was Mr. Dolley's plan. There was no warrant in law for what he purposed to do, but Mr. Dolley has a sort of Rooseveltian knack of finding ways to do things that the law does not specifically provide for. So, some two years ago, he established a bureau in his department for the purpose of advising the people of Kansas, without any charge to them, as to the value of stocks, bonds and other forms of securities offered to them for investment. Wide publicity was given the innovation and almost at once there was a noticeable shrinkage in the number of swindling schemes being operated in the state. Cautious investors welcomed the new bureau and made frequent use of it, but the persons who most needed protection, as usually is the case, were not reached at all. The only way to protect them was

to strike at the root of the evil by driving the swindlers out of the state. Thus was born the "Blue Sky" law.

While he was drafting that law, Mr. Dolley did a good job of it. In the statute book it covers seven pages of closely set type and the bristles stick out of it like quills on a porcupine's back. And it has teeth, too, fore and aft, for the legislature in passing it, to make sure of the job, added a clause which provided that, if the supreme court should declare any one of its provisions unconstitutional, all the others should remain on the statute book in full force and effect.

In brief, the law, which is entitled "An Act to Provide for the Regulation and Supervision of Investment Companies," requires every corporation or association, foreign or domestic, which purposes to sell stock in Kansas, to file with the bank commissioner a clear and complete statement of its affairs down to the minutest details; it must file its written and irrevocable consent to accept service upon it through the secretary of state of Kansas, and pay the expenses of a minute investigation into its affairs by an agent of the bank commissioner. It must agree that no amendment to its charter shall become operative until the amendment is approved by the bank commissioner; it must file copies of its contracts and each of its agents in Kansas must be registered in the bank commissioner's office. The law provides methods of bookkeeping and each company must agree to open its books at any time to any stock holder. If, upon investigation, the bank commissioner finds the concern is solvent, fairly conducted, and, in his judgment, promises a fair return on the securities offered for sale, the commissioner may issue a certificate permitting the company to do business. The certificate, however, recites in bold-face type that "the bank commissioner in no wise recommends the securities to be offered for sale."

If the commissioner isn't satisfied with the company's showing he can refuse the application. Since the law went into effect last March more than seven hundred applications have been filed under it and at the time this is written exactly forty-eight of them were approved and given certificates. Not one of the others dares sell a share of stock in the state, that is, not unless the agent is willing to risk a fine of anywhere from one hundred dollars to five thousand dollars or ninety days in jail or both. Furthermore any person who makes a false statement in filing an application for a certificate to do business subjects himself to a fine of from two hundred dollars to ten thousand dollars *and* not less than a year nor more than ten years in the state penitentiary. And to make it just a little stronger, if any company authorized to do business in the state conducts its business in an unauthorized manner or becomes insolvent, the bank commissioner may immediately throw it into the hands of a receiver and wind up its affairs.

It might be added, by the way, that Kansas has learned so many things about wild-cat stock selling from Mr. Dolley that the judges are just in the right mood to impose the maximum fine and imprisonment on any agent or any company that violates the law. So far, none has dared attempt to violate the law.

When the law first went into effect there was a great clearing out of many of the worst of the fakes which, understanding the "Kansas language" when they read it in the law, saw the uselessness of staying in Kansas any longer. They moved off to greener fields. Others with that unlimited self-assurance, cast-iron nerve and total lack of conscience which goes with their calling, promptly filed their applications and were as promptly turned down. Some quit on that, but there were a few who still were not convinced that the law meant just as it read and that Commissioner Dolley meant just exactly what he said. They protested. Some were grieved at the error which the commissioner had committed in refusing the application; others were insulted.

For these Mr. Dolley had a set formula. "Go out," he would say, "and bring me one person who ever bought stock in your company, or who ever bought stock in any company from you, who ever received as much as five per cent in return from any or all of them and I'll pay you two dollars for each and every one."

They expected to make a bluff and the bluff was called. Up to the time this was written Mr. Dolley hadn't paid out a cent

in that way. Furthermore there hasn't been any favoritism about refusing the applications that have been turned down. Kansas corporations have been turned down just as quickly and just as coldly as foreign corporations.

For instance, a railroad, which, if constructed, would very likely be a good paying proposition, has been projected through a part of the state which needs just such a line. Farmers and business men in several towns have given considerable money toward it in the way of bonuses and some work has been done. Application was made for permission to sell stock and the correspondence in the matter, representing inquiries into every phase of the company from the legality of its charter to the birth records of the promoters, makes a file fully two inches thick. The application was refused, first on the grounds that the company had no assets, and second, because the character of the men promoting it was not deemed by the bank commissioner to constitute a sufficient guarantee of the proper disposition of the proceeds from stock sold. One of the promoters, for instance, was found to have "jumped" a board bill in a distant city, and later to have become entangled with the postoffice department so seriously as to have been forced to take an involuntary "rest cure" for a year or so.

The file of correspondence in that company's case is a good example of the manner in which the "Blue Sky" Law is applied.

"We don't take any man's word for anything," is the keynote of it, and while it may appear that the thing is carried to the extreme, Mr. Dolley estimates that the few thousand dollars the bureau has cost the state has saved the investors already no less than a million and a half dollars. The first thing that was done when the company applied for a certificate was to call for a copy of its charter, by-laws, balance sheet, promotion literature, blue prints, and references for each of the officers of the company. Every promise, estimate or possibility in the literature was noted and each man given as reference was written to. At the same time, through confidential channels, the men given as references were investigated, and through various other channels the record of each man in the company was obtained. Probably no fewer than a thousand different sources of information were tapped, the net result of which was that the certificate was refused. Taken all together, these inquiries have extended into every state in the Union, Canada, Mexico, Central and South America, Europe, Japan, the Philippines and South Africa. Generally speaking, banks are the best sources of information, because the banker has a lively interest in protecting his depositors against fraud. The state bank examiners act as a sort of detective force, also, picking up here and there stray bits of information which often prove quite valuable.

One of the numerous land development companies was found to have no other asset than a cancelled concession in Nicaragua to a tract of land which, even if the concession were valid, could be bought from the government at twenty cents an acre. The company had stocked this at five hundred dollars an acre. The plan, of course, simply was to sell all the stock and let the stockholders fight it out with the government of Nicaragua and get, if they won, land which was worth just one twenty-five hundredth part of what they paid for it.

A majority of the applications made to the bank commissioner have come from mining and oil companies. These present the most difficult problem under the law, because only an expert is qualified to pass judgment upon an oil or mining property—and if the property is in an oil or mineral district any man's guess is as good as an expert's opinion on an undeveloped property. It is the miner's axiom that "Gold is where you find it." So is oil. About the best that can be done with these companies is, when the property is in a recognized oil or mineral district, to base the action to be taken upon the character of the men who compose the directorate. Then Mr. Dolley plays safe by refusing certificates to nearly all of them. In mining and oil stocks the safest rule to go by is that nobody is giving anything away. If a group of men have a gold mine with reasonably good prospects—and bear in mind that the only mine with a reasonably good prospect is one that already is "in ore"—there is no need for

them to sell stock—in other words to give away part of their mine for less than it is worth. The same holds good, in a general way, with oil companies.

One of the "mining" companies, for which a certificate recently was applied, was found to consist of the keeper of a desert water-tank grocery store, a saloon-keeper, a gambler, an employee of a livery stable, the porter of the saloon, and the clerk in the grocery store. The mine was a ten-foot hole in country rock that wouldn't assay a dollar to a million tons.

Another company, composed of a bunch of gamblers, had located half a dozen claims on state school land already under lease, to which the company couldn't get the shadow of a title. The land had ore, all right, but the only thing the stockholders could get out of it would be the right to sue the state for possession.

HOW'S THIS FOR PAINSTAKING CARE?
The correspondence in the investigation of one company made a file two and a quarter inches thick.

With manufacturing, plantation or irrigation companies, it is a simple matter almost at once to decide the merits of the securities offered for sale. One Arizona company, for instance, offered land "close to the Roosevelt Dam." It was close, too, but it couldn't have been watered for a million dollars an acre. Just the opposite was a Gulf Coast townsite proposition where it would have required a deep sea diver to set the surveyor's stakes.

Another favorite form of swindle is the life insurance agency. The investor believes he is buying stock in the company itself, but as a matter of fact he simply is buying stock in a company which has a contract to write insurance for some established company—a mighty doubtful asset at its best. For instance, there was a certain company in Detroit whose only asset was a contract to write insurance for a certain percentage. This contract was then sub-contracted to an agency company. Stock on both companies was sold to investors and it is estimated by Mr. Dolley that not less than $100,000 of the two stocks was sold in Kansas, some of which was sold even after the life insurance company had learned of the fraud and cancelled the contract, which was the only asset of both companies.

Wireless telegraph companies also have offered a big field for fraud in the last few years. One of them disposed of an enormous quantity of stock in Kansas before post-office inspectors raided the company's office and sent several of its officers to prison. In Topeka, the state capital, alone, Mr. Dolley found stock for which $80,000 had been paid, and found only part of what had been sold. Probably there was at least $20,000 more invested in the company in that one city, and not one cent of it ever will come back. Widows, elderly maiden ladies who hoped to lay aside enough to afford them a competence when they should be no longer able to work; young men investing for the same reason, and business men who wouldn't put a cent into a legitimate manufacturing enterprise in their home town, all were caught.

Such instances might be multiplied to an indefinite length, but they may be taken fairly to illustrate what no longer is going on in Kansas, but which is going on in every other state. People are being swindled right and left, without the slightest compunction on the part of the swindlers or any fear of the law. The lawmakers are too busy protecting their constituents against the "rapacity" of the railroads and other forms of legitimate industry into whose securities the people

might put their savings if they were not frightened away from them by the lawmaker's cry of "wolf."

The value of a law such as the Kansas "Blue Sky" law lies, of course, in its enforcement. Enforced partially it is nearly as bad as no law at all, but enforced impartially, and by giving the investor the benefit of the doubt, it is bound to save—and is saving—the people of Kansas, millions of dollars. And Kansas is fortunate in having such a law and in having it impartially enforced.

But Kansas is not alone in profiting by the law. The little corner of Mr. Dolley's office, set aside for the one clerk who was expected to handle all of the routine work pertaining to the enforcement of the law, has grown into a national institution which might well be called a national bureau for giving free advice to investors. The one clerk has multiplied into two clerks and three stenographers who are kept busy six days in the week answering inquiries that come from every state in the union as to the advisability of purchasing stock or bonds in this or that company, or whether investments already made are considered safe. In one week, by actual count, there were 842 letters of that kind received from other states.

In addition to this heavy correspondence, every letter of which is answered with all the information considered necessary, come hundreds of letters thanking Mr. Dolley for warnings already extended.

"God bless you for your work, you have saved me from ruin," is not an uncommon statement in them. Some of them are pitiful. "I have invested every cent I had in Blue Sky Consolidated. Is there any way I can recover it?" is the question contained in hundreds of the letters. The majority of these letters are from women, whose writing and stationery indicate a station in life where their little savings have been a fortune to them. After reading half a dozen of them, one rather wishes the law provided that any male, able-bodied citizen might take an axe and send a few of the Blue Sky peddlers in the opposite direction from the location of their stock in trade.

In this admirable plan for the conservation of the poor man's money, there is one defect, and it will exist either until every state in the union has enacted a law similar to the Kansas statute, or until the government requires the same conditions of the investment companies that is required in the Kansas statute before permitting them the use of the mails and express companies. As the situation now is there is nothing to prohibit the fake investment companies from advertising their insecure securities and transacting a large business through the mails before the postoffice inspectors can ascertain the status of the company and obtain evidence which will warrant the arrest of the swindlers for using the mails to defraud.

The work of the postoffice department has been greatly facilitated, however, by co-operation with the Kansas banking department, whereby information of fake stock and bond companies regularly is exchanged. The information furnished by the Kansas banking department has resulted in the arrest of a number of fake promoters and the driving of several others out of business. The difficulties under which the postoffice department works are so great, however, that, as shown in the annual report of the Department of Justice, only ten cases of that kind were brought before the courts in the last fiscal year, while there must be anywhere from a thousand to five thousand companies whose stock is for sale but is worthless at any price.

So far as the states are concerned, it is probable that within another two years a majority of them will have laws similar to the Kansas statute. Every day's mail brings to Mr. Dolley letters from members of the legislatures of other states asking for copies of the Kansas law with a view to drafting a similar measure. Every state in the union is represented in these letters, and in one case, Missouri, ten members of the legislature were represented. Five requests have come from other countries.

"I never dreamed of the extent of the swindling operations carried on by dealers in stocks and bonds until I heard of your Kansas law and made an investigation here at home," an Illinois legislator wrote. "My investigation was neither extensive nor deep, yet it leads me to believe that three out of five persons in

the ordinary walks of life who have the saving habit have been swindled at some time or other in the purchase of worthless stocks. If the conditions I found in my own neighborhood obtain throughout Illinois, the swindlers must have obtained millions of dollars."

Only a few days ago four members of the firm of Burr Brothers, one of the most successful promoters of worthless stock in the country, pleaded guilty in the United States court in New York to a charge of using the mails to defraud, and were sentenced to one year each in the penitentiary on Blackwell's Island. Shelton and Eugene Burr, president and secretary-treasurer of this company, were born and reared in Leavenworth, Kas. Their offices in New York occupied an entire floor of the Flatiron Building and postal inspectors who raided the offices and arrested the members of the company November 20, 1910, estimated that they had taken in somewhere between forty and fifty million dollars.

Mr. Dolley estimated at the time the arrests were made that something like $300,000 of that amount had been received from Kansans. Later, when it was learned that the Burrs, through their wide acquaintance in Leavenworth, had sold large quantities of stock there, the estimate was raised to one-half million dollars. Out of their operations, the four partners in the Burr concern are estimated to have made fifteen million dollars, and they had just entered upon an advertising campaign which would have cost one million dollars when the postal authorities arrested them.

After the raid, Postmaster-General Hitchcock, who was in personal charge of the raiders, gave out an official memorandum which showed that when the Burrs ran short of stock in companies already organized, they organized new companies to keep up the golden stream which poured in on them. Among the stocks which were entirely sold out and of which the postmaster-general said, "the greater portion of the money evidently has gone into the hands of Burr Brothers," were the Kern-Western Oil Company, the Coalinga Aladdin Oil Company and the People's Associated Oil Company. A list of seventeen companies, all of which had gone out of existence, also was given, in all of which the Burrs sold stock. According to the postmaster-general, not one of the twenty-eight companies, for which the Burrs sold stock "has paid a dividend and most of them are failures."

A postal inspector, who was in charge of the offices after the raid said:

"Burr Brothers played fast and loose with their clients and the most pitiful feature is the manner in which widows have been fleeced on absolutely worthless stocks. Mrs. Laura E. Lawrence of Philadelphia had invested $4,000, the amount of life insurance she had received at her husband's death, in worthless mining stock. Mrs. David Crabb, a poor widow with a large family, had invested all her savings, $2,500, in absolutely worthless oil stock. The first day's mail after the raid brought in $650 in cash and $20,000 in money orders, in addition to which there was a large bunch of telegrams, making reservations of stock, from deluded victims who were afraid they would lose the chance to be swindled out of their money."

Wisconsin is the only state which has a law the effect of which is designed to protect investors, but it has failed in attempts to enforce it, in the work it was designed to do. But the Wisconsin law will be amended or repealed and a new law enacted, for a number of legislators in that state have asked for copies of the Kansas law.

So, the poor widows of Kansas, who gave their little all in exchange for worthless sheets of gaudy paper have not lost in vain. They have been the instruments for putting on the Kansas statutes a law which has saved millions of dollars for those who could not afford to lose it, and for awakening the legislators in other states to one of the cruelest systems of robbery that has ever flourished anywhere in the world.

VOLCANOES MAY MAKE WORLD HIGHWAY

By William Thornton Prosser

OUT on the Pacific Coast they are developing the fascinating idea of a broad highway, in sight of the Pacific, from the southern tip of the South American continent to the snows of the Arctic Circle. It is not beyond the pale of probability that some day this highway may not only be completed, but may cross to Asia on a new continent arising to link the old and the new hemispheres, where Bering Sea's shallow waters now ebb and flow, and so continue on through Siberia, and turbulent Cathay until it terminates in sight of the Atlantic.

But it is not this highway that interests us here; it is the possibility that the fires of earth now disturbing southwestern Alaska and the 1,000-mile chain of Aleutian Islands, will combine with other causes to raise the floor of Bering Sea until it emerges high and dry, joining the Americas with Asia, the Occident with the Orient, man's newest conquest with the cradle of his race.

Nor is this possibility so remote, for the western reaches of Alaska with the Aleutian dots of land form the earth's most agitated volcanic region. Half a hundred volcanoes have been counted west of Cook Inlet, some of them smoking and quavering, and throwing ash and lava far and wide, while the famous Bogoslof Islands, just off the route of steamship travel into Bering Sea, rise high in the air and sink again into the sea with an attendant demonstration of such grandeur and awe-inspiring magnitude as eye witnesses declare will be their most vivid remembrance until their dying day.

Even in the gulf of Alaska the restless forces of nature are extremely active, for within the last two or three years submarine mountains have suddenly arisen in the depths of the sea, snapping the government's Alaska cable in twain with such a jerk that the ends, on one occasion, were separated by more than a mile. Repeatedly has the copper strand been separated in this way, and soundings have shown the earth to have arisen much nearer the surface of the gulf than it was ever known to be before in that particular locality.

VOLCANIC ACTIVITY MAY HEAVE UP THE BED OF BERING SEA EVENTUALLY, AND LINK NORTH AMERICA TO ASIA.

Much of Bering Sea's floor is a great level stretch only a few fathoms down, and constantly approaching the water level. Scientists and members of the United States geodetic survey attribute the upheaval beneath the sea to the same subterranean convulsions that blow a fiery breath through the nostrils of so many volcanoes. Assisting this action in making Bering Sea a pond preliminary, perhaps, to obliterating it altogether, are the rivers of Alaska, which bring down annually vast sedimentary deposits of alluvial matter that are scattered far out toward the Siberian shore.

A great earth giant, lying prone beneath both sea and earth, and struggling to arise, might be imagined gasping for breath, kicking his feet in the Alaskan gulf, elevating his forehead in Bering Sea, puffing through the volcanic rim of isles that form his mouth, and protruding his tongue and drawing it back again where the Bogoslofs hysterically bob up and down. Indeed, the natives of all that region believe that demons and supernatural agencies are making themselves felt by these sometimes terrible disturbances that rack the islands and adjacent mainland.

In later times the Russians gave historical accuracy to data relating to various eruptions, and Admiral Bogoslof, in the service of the Czar, was the first, late in the eighteenth century, to discover the Bogoslof Islands. In still later times—within the last half-dozen years—plenty of support has been given to the theory that a continent is in the labor of birth, and soon may emerge to the light of day.

A dozen volcanoes, some apparently dead and others at intervals showing decided signs of life, dot the west shore of Cook Inlet, and the Alaska Peninsula, which separates Bering Sea from the Alaska Gulf. No fewer than forty-two volcanoes have been counted on the Aleutians, stretching eastward from the mainland. Some of these are so remote from the lines of travel that they are only seldom seen, while others in the vicinity of the ship-channel through Unimak Pass are within the visual range of almost every voyager into Bering Sea. For five years J. E. Thwaites, purser of the little mail steamer *Dora*, plying out to the

CHERNABORO, WITH HALF ITS SUMMIT TORN AWAY BY VOLCANIC ERUPTION.

tremendous volcanic manifestations years ago, and evidence in

THE INDIANS WERE DRIVEN TO THE MAINLAND BY THIS ERUPTION.

COPYRIGHT 1910, J. E. THWAITES.

PARLOT VOLCANO, ON ALASKA PENINSULA, IN REPOSE AND IN ERUPTION.

westward from Seward, Alaska, has been endeavoring to catch on his camera film direct evidence of this activity, and only lately has he succeeded in presenting pictures of a group of smoking volcanoes such as may be considered unique throughout the world.

Not only were points of vantage difficult for Mr. Thwaites to attain, at times when the volcanoes were executing their best performance, but he had as well to contend with atmospheric conditions that rendered his task all the more difficult and uncertain. Yet he succeeded in obtaining photographs of almost all these most active mountain chimneys above the subterranean fires. Early in 1911 THE TECHNICAL WORLD presented remarkable photographs of an eruption at the Bogoslof Islands, when a new island sprang like Venus from the sea. These were obtained from the deck of the United States revenue cutter *Tahoma,* one of those guardians of the northern seas.

Indians of the Cook Inlet district relate a mythical tale, as picturesque as a fragment of Greek mythology, how the warring gods of fire and water drove them from their ancestral home on Augustine Island, which stands at the en-

trance to the Inlet. On the island stands Chernaboro volcano, with half its summit torn away, and still emitting steam and smoke. The island had been chosen as a home by the natives because of the advantages it offered for otter hunting, and they had no fear of the mountain towering above them.

The violent outbreak of Chernaboro, coming almost without warning, destroyed the native village, and drove the surviving Indians in panic to the mainland. They never again dared to go back to live beneath the treacherous mountain. The date of this eruption is placed at about seventy-five years ago. Russian annals, as far as known, make no reference to it, but the Muscovite charts of 1825 show a channel between Augustine Island and the Alaska peninsula, where now there is only shallow water.

A new crater was revealed with the battle between the gods of fire and water, and the sulphurous vapor which Chernaboro gives off has rimmed the summit of the mountain with bleaching skeletons of birds that ventured too near its heated cone. Yet even if the volcano should never again evince violent tendencies the natives would not return to the island, for they believe it was their residence upon its shores which angered their elemental deities.

The volcano most commonly seen by voyagers into Bering Sea is Shishaldin, standing on Unimak Island, not far from Dutch Harbor, which is the coaling station of the Aleutians. Coincident with the 1910 upheaval in the Bogoslofs, Shishaldin awakened into eruption, and on previous occasions synchronous activity had been noticed. Shishaldin spread smoke and ash in every direction. Vessels reached Nome with their decks covered with volcanic deposits. One seemingly fabulous story related that the ash assayed showed particles of gold—yet why not? Seven or eight years ago Shishaldin became a great torch of the Arctic; fire spouting from its crater was visible one hundred miles away.

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SHISHALDIN, WHICH BECAME, THROUGH VOLCANIC ERUPTION, A GREAT TORCH OF THE ARCTIC.
Fire spouting from its crater was visible one hundred miles away.

AKUTAN VOLCANO IN ACTION.
Often at Unalaska can be heard booming this peace disturber of the Aleutian solitudes.

This crater of Shishaldin's is 1,000 feet across. In spite of the noxious vapors one may take advantage of the wind, climb to the summit, and stand on the very edge of the crater, looking down into the seething depths. All down the sides of the 10,000-foot mountain are streams of lava; in fact the outpourings of molten rock have made Shishaldin one of the most symmetrical of mountains—a veritable sugar-loaf. Adventurous spirits who make the ascent find its sides punctured with pot-holes or springs that emit boiling sulphur streams.

When the wind goes down Shishaldin's thin stream of black smoke rises to a

U. S. REVENUE CUTTER *RUSH*. ONE OF THE LITTLE FLEET THAT PATROLS BERING SEA.
This photo was taken from the deck of the mail steamer *Dora*.

height of miles in the air, and produces an impressive spectacle. Occasionally the mountain will belch forth a ball of smoke that hovers for an instant above the snow-covered summit; then rises like a balloon into the air and dissolves at great height.

Not far from this volcano, on Unimak Island, is Pogromno, whose crater has been shattered by the forces of nature. Yet from its summit there curls almost continuously a wisp of smoke, streaming off lazily with the wind.

The "Noise-Maker of the North" is the soubriquet given Akutan volcano, situated forty miles from the settlement of Unalaska, on the island which bears its name. Often at Unalaska can be heard the booming of this peace disturber of the Aleutian solitudes. Sudden and violent are its explosions, like the detonations of huge quantities of explosive far down in the earth. In more ways than one does the action of Akutan resemble the discharge of great cannon. Perhaps in the volcano's heart large volumes of gas come in contact with tremendous heat.

Akutan's guns are fired in pairs; first a short, sharp bang, and then a louder, longer report. At each explosion a puff of smoke is forced from the crater high into the air, dissipating itself a few moments later among the clouds of the upper atmosphere. Navigators who have passed Akutan while in action say the spectacle is most entrancing when the mountain is partly hidden by the fog that is so prevalent in Bering Sea. Says Mr. Thwaites:

"With a tremor of the mountain, and then a crash comes the first of the twin explosions, and the puff of smoke shoots up from the crater, tearing a hole in the thick fog blanket that engulfs the summit of the peak. The larger report and puff of smoke follows, spreading the mist even wider, and disclosing for an instant the peak of the noise-making mountain. The fogs then settle slowly, shutting out all sight of the mountain top until the next explosion. These demonstrations occur with precision, and sometimes extend over a period of days, accompanied by earthquake shocks of greater or less duration."

"Pop-off" has come to be the nickname of Pavlof volcano, situated on the lower end of the Alaskan peninsula. The photograph of Pavlof in action shows not only the smoke issuing from the crater of the mountain, but also the slopes blackened by the volcanic ash. Pavlof's eruptions are usually concurrent with those of

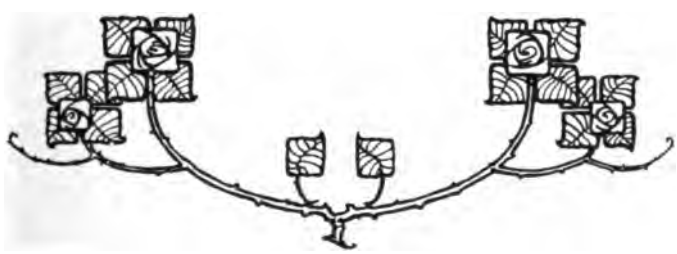
Shishaldin, and disturbances in the Bogoslofs. Shumagin Islands, sixty miles away were covered to a depth of half an inch with the Pavlof effluvia, in 1910, and at the period of greatest activity Pavlof sent cannonading thunders through a circle 100 miles across. The ash upon the surface of the sea is whipped into snowballs that finally are heaped upon the beach.

Pay a native fifty dollars a day and he will lead you to the top of Makushin peak, which is plainly visible from Dutch Harbor. Usually Makushin is smoking, but occasionally it gets much more violent in its demonstrations. Those who have braved its dangers assert that near the crater iron rods stuck into the ground will be melted by the intense heat. Hundreds of boiling springs have created snow and ice caves on the mountain side. Near the crater rim are large deposits of sulphurous materials that have been prospected and before long probably will be mined.

But the list so far includes only a few of the better known volcanoes of this disturbed region, some of them marked by the Indian designation, rendered into English spelling as nearly as possible, and others bear the names given them by Russian explorers and geographers years before the United States came into possession of Alaska. Besides those given there is Kupreanoff, standing at the head of Stepakof Bay, on the mainland, which is unique in that its crater lies in the center of a field of glacial ice. Smoke and steam rise through the crevasses in a hundred different places. With these crevasses covering a wide area it has been virtually impossible to explore the exact center of Kupreanoff.

Redoubt Peak and Becharoff are well up the peninsula; both are rather difficult of access, and neither has been thoroughly explored. To the north and east of Becharoff is Iliamna, towering above the 12,000-foot level, and having three distinct craters. Douglas, looking as if a huge octopus gripped its vitals, stands up sheer and bold above Cook Inlet, not far from Chernaboro volcano, on Augustine island. This likeness to an octopus is produced by the chilled streams of lava that streak down from the summit of the peak, vividly suggesting tentacles. Farther inland the Alaskan range has other peaks that occasionally give forth evidences of life, while in addition to the active volcanoes there are hundreds of dead craters in the mountain chain that buries itself in the sea in a seemingly vain endeavor to reach the Asiatic shore.

Alaska is becoming a better-known land every year, and the time will come when all her mountain ranges, her valleys and her plains will be thoroughly explored, but it is no exaggeration to say that the Russians knew as much about her coast line as we have learned in the last half-century. Controller Bay, of recent notoriety, was discovered before Admiral Vancouver found Puget Sound!



A CATCH OF HALIBUT.
The halibut is one of the finest and largest of food fishes.

GATHERING NEW MARINE CROPS

By

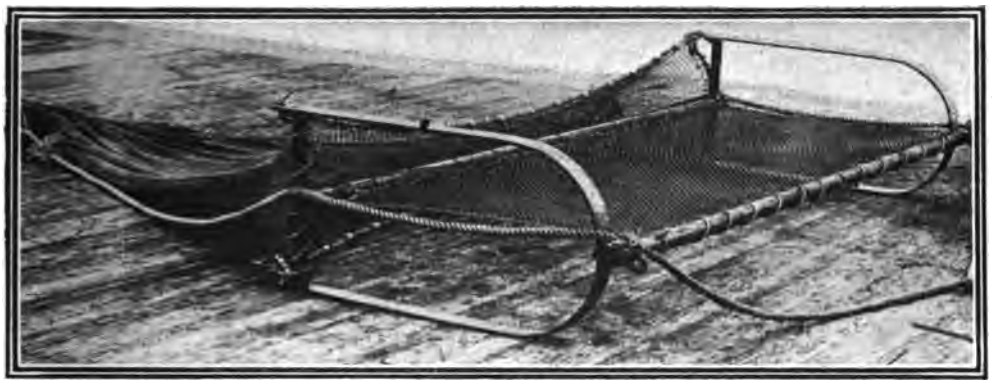
RENÉ BACHE

A PROJECT whereby, through the adoption of a new and simple method of capture, ten thousand square miles may be added to the available fishing grounds of our North Atlantic coast, is being earnestly advocated by the government Bureau of Fisheries.

Stretching from Cape Cod to Cape Hatteras is a vast area of sea bottom which, though fairly swarming with valuable finny species, is not fished at all. Its annual crop, which might feed the whole population of the United States, is allowed to go to waste. Ordinary methods of capture cannot be successfully used for most of these bottom fishes—especially the soles, whose mouths are too small and weak to take or hold a hook.

One of the most delicious of the fishes served in our expensive restaurants is sole. Fried in crumbs, and called a "filet," it is a morsel for the gods. Yet it is nothing more nor less than a flounder—quite possibly hatched originally at one of the New England stations of the Fisheries Bureau. During the last fiscal year the Bureau hatched and liberated 889,000,000 such flounders, or "flatfish," at Wood's Hole, Gloucester, and Boothbay.

Far superior, however, is the so-called pole flounder, or deep-sea flounder, which occurs in deeper waters. It is in texture and flavor so like the European sole,



A SMALL BEAM TRAWL.
These scoop nets on runners are very effective in securing fishes that live along the ocean's bottom.

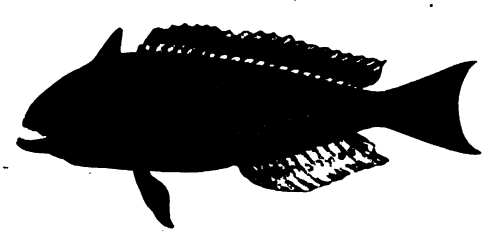
though of a different finny genus, that even an epicure cannot tell the difference. In 1877 it was first discovered in the deepest part of Massachusetts Bay; and since then it has been caught south of Cape Cod, at depths of one hundred fathoms or more, and by Agassiz off the entrance of Delaware Bay, at four hundred fathoms. The fish is a permanent resident throughout the year in the deep basin of Massachusetts Bay and along the edge of the continental slope for hundreds of miles up and down the coast.

In truth, the sea bottom all the way from Massachusetts to the capes of Virginia is almost literally paved with flounders of this valuable species. Although they cannot hold fast to a hook and line, they could be caught in incalculable quantities by the use of the "beam trawl"—a huge pocket-shaped net set in an iron frame on runners like those of a sled. Such a trawl, dragged over the bottom, picks up everything in its path—especially the bottom fishes.

This form of apparatus is old enough and familiar enough in European waters, where, particularly in the North Sea, it represents the principal method of capture. But in our own country it is a novelty. Since the Fisheries Bureau went into the business of hatching flounders on so enormous a scale, thus building up a new and important fishery in New England, small beam trawls, hauled by sail and motor boats, have been used for catching them, and by this means 11,500 barrels were taken during the last year off Falmouth alone—all of them of one species, the small "winter flounder," to which efforts in the line of artificial propagation are exclusively devoted.

Recently, however, four steam vessels at Boston have been equipped with large beam trawls. The first time one of them went out, a catch of 25,000 pounds of fish was made, and the net was carried away. One should understand that such a net is seventy-five feet long, and its mouth fifty feet wide, so that, when dragged over the sea-bottom, it is liable to swallow considerable quantities of live material. The deck of a trawler after a haul presents a wonderful spectacle

THE SEA BOTTOM FROM MASSACHUSETTS TO VIRGINIA IS PAVED WITH FLOUNDERS.



THE TILE FISH.
In 1882, some great sub-ocean catastrophe nearly wiped out this species.

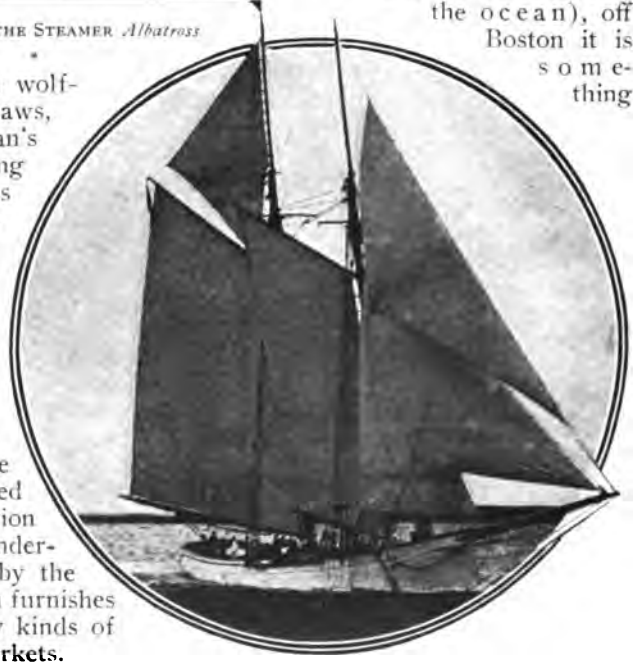
BEAM TRAWL ON THE DECK OF THE STEAMER *Albatross*

—writhing conger eels, fierce wolf-fishes with wickedly snapping jaws, dogfish (always the fisherman's enemies), wide-mouthed "fishing frogs" (which somebody has called "animated carpetbags"), and many other queer-looking finny creatures being scattered among the useful fishes; not to mention huge spider-crabs, molluscs of various kinds, sea anemones, and other invertebrate curiosities ad infinitum.

In order to comprehend the exceptional opportunities offered for beam-trawling in the region here described, one should understand exactly what is meant by the great "continental shelf," which furnishes a feeding ground for so many kinds of fishes now unknown to our markets.

The eastern edge of the North American continent is not marked by the line of breakers which fall upon our shores. It is far out in the ocean, beneath the waves. Thus, if the ocean were dried up, a person starting eastward from Atlantic City would have to walk straight on for a distance of about sixty miles before reaching the true edge of the continent. During his journey he would find the sea-floor sloping very gradually downward; but, at the end of the sixty miles it would suddenly drop almost precipitously to a depth of two and a half miles—the normal depth, that is to say, of the bottom of the ocean.

It will be seen, then, that the eastern edge of the continent is actually overflowed; and thus is formed a sort of subaqueous "shelf," which widens as it runs northward. Whereas opposite Atlantic City it is only sixty miles wide (its edge being about that far out in the ocean), off Boston it is something



THE FISHERIES BUREAU SCHOONER *Grampus*, WHICH REDISCOVERED THE TILE FISH IN THE YEAR 1892.

like one hundred miles in breadth.

The "shelf," as already explained, is the feeding ground of multitudes of edible fishes which, like the Pole flounder, are unknown to our markets for the reason that no practical method has hitherto been applied for their capture. When vessels equipped with steam apparatus for hoisting trawls, such as the four recently built at Boston, exploit the resources of this vast area, the production of fish food on our North Atlantic coast will be multiplied many fold, and the living of great numbers of people will be materially cheapened thereby.

Most important, perhaps, of all the species concerned is the tile fish—the estimable finny creature which was the victim only a few years ago of so remarkable a catastrophe. Although supposed at the time to have been thereby rendered extinct actually, it has reappeared, and today is probably as plentiful as ever—that is to say, plentiful enough to become as important a source of food supply as the cod, if it were sought by systematic and proper methods.

LOWERING A BEAM TRAWL FOR HALIBUT.

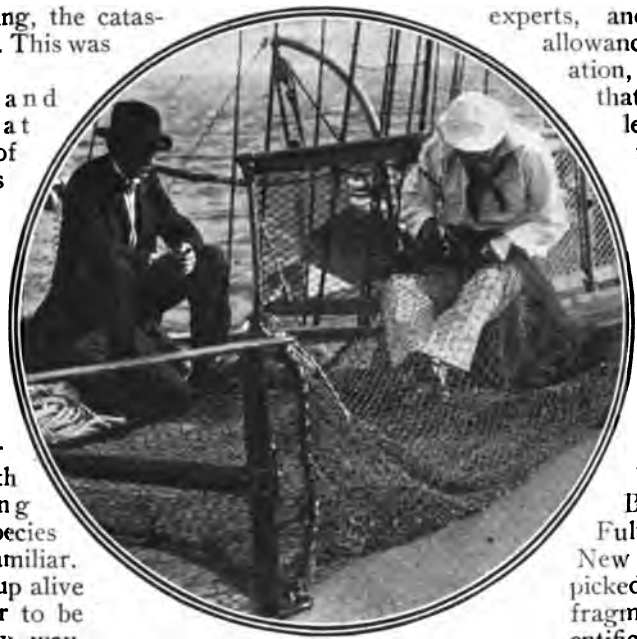
Piscatorial history states that in 1878 the fishing schooner William V. Hutchings, under command of an experienced skipper named Kirby, was looking for hake in new waters about one hundred miles south of the island of Nantucket, when, on examining the baited lines (extended over some miles by an arrangement of anchors and floats), many fishes of an entirely unfamiliar species were found attached to the hooks. Extraordinarily brilliant in color, with heads like that of a dolphin, and covered with greenish yellow speckles, they weighed from five to fifty pounds apiece, the biggest being about three feet long.

Captain Kirby threw them all overboard. Afterwards, having tried one for dinner and having found it very good, he caught a lot more and took them to Gloucester, where he sold them for a small price. Later on, news of the matter having been circulated, the Fisheries Bureau steamer *Fish Hawk* went to the place and captured a few specimens. Their flesh being declared excellent, it was realized that an important discovery had been made, and the government experts decided to make a thorough investigation, with a view to outlining the area occupied by the new species of fish, to which the name Lopholatilus chamœleonticeps was given—meaning "chameleon-headed Latilus with a crest."

Unfortunately, a good deal of time was lost in getting ready to begin, and, just as the scientific expedition was on the

point of starting, the catastrophe arrived. This was early in 1882.

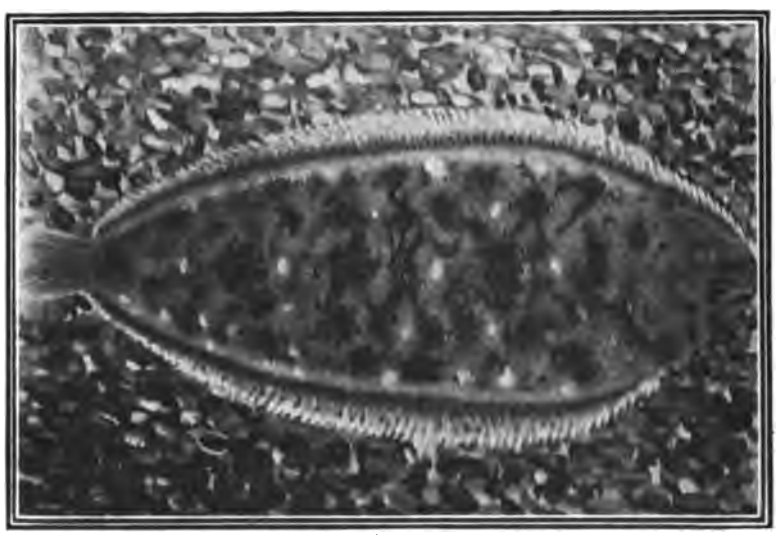
In March and April of that year, skippers of sailing vessels arriving at the ports of Boston, New York, and Philadelphia, reported that they had passed through many miles of water covered with dead and dying fishes of a species wholly unfamiliar. Those picked up alive did not appear to be injured in any way, but merely paralyzed. Some of the vessels had traversed a belt sixty-five miles wide of water that was profusely sprinkled with the fishes, and one skipper declared that he had passed through 150 miles of them.



MENDING A BEAM TRAWL ON THE GOVERNMENT SHIP *Albatross*.

Quite a mass of testimony on the subject was got together by the fishery experts, and, making all allowances for exaggeration, it was estimated that an area of at least 7,500 square miles must have been covered with the fishes, which (from specimens exhibited) were very promptly identified as the tile fish—a name given to the species by Eugene G. Blackford, of Fulton Market, in New York City. He picked out a small fragment of the scientific name bestowed upon the creature, and so christened it for popular purposes.

Assuming that there was only one fish for every 4,000 the sailors thought they saw, the total number found floating in the manner described could not have been less than one thousand millions—enough to furnish 300 pounds of fish for every



THE TRUE EUROPEAN SOLE, SHOWING HOW IT MODIFIES ITS OWN COLORATION TO MATCH THE BRIGHT PEBBLY OCEAN BOTTOM.

man, woman and child in the United States. Doubtless, however, this was an absurdly low estimate.

When, soon afterward, the scientific expedition did at last set out, it could not find a single tile fish alive. Every means of capture was tried in vain, the indication being that the species had actually been rendered extinct!

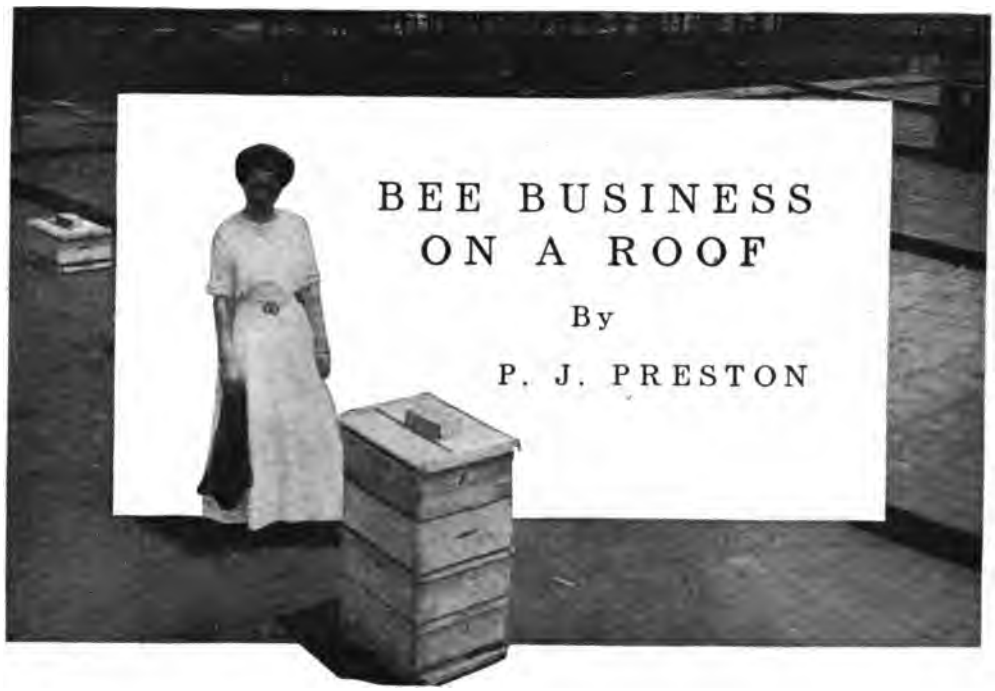
Even to this day nobody knows what the cause of the catastrophe was. It was at first attributed to a volcanic disturbance at the bottom of the ocean. Since then, however, a theory has come to be more widely accepted to the effect that the encroachment of a current of cold water from the Polar regions upon the feeding grounds occupied by the tile fish brought about the calamity.

A HALIBUT FRESH-TAKEN BY THE FISHER.
Halibut is growing scarce in the North Atlantic. The North Pacific is now furnishing the greater quantity.

Mention has already been made of the relatively steep declivity which, descending to the deeper sea-floor, marks the true edge of the continent. A broad belt along this declivity is bathed by a current of warm water from the Tropics. It is not the Gulf Stream (which is a surface current), but a warm river running down below. The tile fish, which is a tropical animal (accounting for the remarkable brilliancy of its coloration), finds its way northward along this warm belt of bottom. But it so happened, late in the winter of 1882, that a chilly current from the Arctic invaded the belt and froze all the tile fish that were in those waters to death.

Whether this theory be correct or not, it is certain that nothing was seen of the tile fish for ten years, though efforts were repeatedly made to find it. In 1892, however, while the Fisheries Bureau vessel *Grampus* was pulling up some trawl lines south of Nantucket, a living specimen of the lost tribe was actually found struggling on one of the hooks! Only one was caught, but the discovery was hailed with utmost delight, because it proved that the species was not extinct after all. On other trips half-a-dozen more were captured — the females ripe with roe, showing that reproduction was going on. Inasmuch as this fish is evidently very fecund, and probably has few enemies to fear, being itself of large size and rather fierce, there would naturally be expectation of its rapid multiplication.

Inasmuch as the species in that portion of the warm belt which lies south of the mouth of the Delaware did not suffer at all presumably from the catastrophe described, it would be likely soon to repopulate its northern feeding grounds, when former conditions were restored. Presumably it is today as abundant on those grounds as ever, and might be obtained thence in numbers equal to the cod, if beam-trawls were employed for its capture. It is a more desirable fish than the cod, being more delicate and of a better flavor. Inasmuch as the fishing grounds are only from sixty to one hundred miles off shore, fishermen could readily carry the tile fish in a fresh condition, on ice, to New York, Boston, and Philadelphia.



DETERMINED to benefit by the work of others while she worked herself, Miss Margaret Kehoe, a stenographer in an office building in Vine Street, Philadelphia, hit upon the plan of starting an apiary on the roof. It was a roof that lent itself readily to the idea and with the consent of the owners of the building Miss Kehoe installed her bee hives. Now there is a thriving colony of honey-makers busily engaged in gathering honey and storing it for the benefit of the clever little girl who originated the idea.

Very few of the office workers in the neighborhood know of the existence of this roof apiary. The roof is not overlooked by other buildings and as adjoining roofs are not visited by the tenants the apiary established by Miss Kehoe is not interfered with and no one is the wiser for the innovation. The bees give very little trouble. As any one knows who has possessed an apiary the little collectors go about their business day by day and require no attention. They feed themselves, manage their own affairs and ask only to be let alone to toil the merry day through. If they realize that the honey they are so industriously storing is to benefit the owner of the hive and not the bees themselves they don't let the knowledge trouble them or interfere with their daily program.

The keeping of bees being one of the profitable experiments that can be undertaken without any great effort, at slight expense and with scarcely any labor involved, the originator of the roof apiary finds it no tax on her time or her resources to manage the little honey business she has established.

The only outfit required in starting an apiary of this kind is a hive or two, a colony or two of Italian bees, a veil, a smoker and a little practical knowledge added to the book learning that any one can acquire from a volume borrowed from a library. The apiary can be started with a capital of twenty-five or thirty dollars and if you have no roof on which to keep the hives, and no back yard they can be kept on the porch. As the popular idea of bees, however, is that they are vicious little insects, given to sting on sight and at times showing a fiendish desire to attack in a body, it is well to start the apiary as Miss Kehoe did, out of sight of every one and where there can be no possibility of interference with the industrious little bees.

SMOKING THE BEES TO QUIET THEM BEFORE RAISING THE LID.

ONE OF THE BUSIEST OF THE HIVES.

MISS MARGARET KEHOE ALLOWING BEES TO CLUSTER ON HER BARE ARMS TO SHOW HOW GENTLE THEY ARE.

Miss Kehoe has only been familiar with the habits of bees for a few months, but she has entirely lost all fear of them and has learned that the popular idea of the viciousness of the bee is entirely wrong. To prove this she permitted two clusters of bees to swarm on her arms and in one of the pictures she can be seen with the masses of bees held in this way, smiling at the camera, not the least bit nervous and confident that the bees would be gentle with her, as indeed they were.

It would not be possible to take these liberties with the old time black or hybrid bees. But the advance made in the bee keeping industry includes the importation of the Italian bee, a much more gentle variety than the older kind. The Italian bee will not sting unless driven to do it in defense of his home and his honey. Miss Kehoe wears a veil sometimes when working around the hives, but at times she works entirely without this protection and is never stung. In fact she wears the veil more to keep the swarms of flying bees from her face and eyes than from any fear of harm from them. There is also, she declares, a great deal of exaggeration concerning the harm done by the sting of a bee. If brushed off quickly the bee sting, which is left in the wound with its store of poison, is harmless. The mistake made is to try to pick the little sting out with the thumb and finger. In squeezing it this way the poison is pressed in and the very object that is to be avoided is accomplished.

It may be expected that Miss Kehoe will duplicate the experience of another city bee keeper who writes:

"Began the season with three colonies; divided and swarmed to nine and took 362 sections of fine honey late in the fall. I have spent about $100 since beginning, but now have nine good swarms, 25 supers and three empty hives with everything complete and the outfit is worth over $200. Altogether I have taken 622 sections of honey of which $115 worth has been sold. All my honey sells for 25 cents per section and I sell out as fast as I can deliver it."

It should be remembered when comparing the plan of bee keeping with that of chicken raising or any of the kindred ideas that the suburbanite or city dweller has for raising money, that the bees require no feeding, they shift for themselves all the time, they are working for you every day without any cost to you, they take up little room in the establishment, are not likely to get you "in wrong" with the neighbors, if properly placed as these of Miss Kehoe's are, and the initial outlay is scarcely anything.

The Stoker

WAY down below the lower deck an' just above the keel
Our stoke-hole crew they tramps around on hard and smokin' steel,
Right in a glare that makes you blind, a heat that makes you reel,
We feeds the blazin' boilers day an' night,
We're red of eye an' black with coal an' though the shift is short,
The sweat of workin' in that hell is measured by the quart,
This stokin' liners' boilers ain't no mollycoddle sport
But we gotta keep the boat a-goin' right.

It's shovel, shovel, shovel!
An' it's sweat, sweat, sweat!
With the heat a whoopin' round you
An' yer hull frame wet;
With the cinders all a-droppin'
An' the grates a-roar,
As they seem to yell for fuel
Sayin' "More! More! More!"

The Captain on the windy bridge is something grand to see,
An' the Engineer's a personage as great as he can be,
But the tub would never travel if it weren't fer mugs like me,
The guys you never know is on the ship,
If we didn't keep on stokin' spite of all the sweat an' stew,
If we didn't feed the boilers what the devil would they do?
There wouldn't be no power for to turn the bloomin' screw
An' there wouldn't be no record-breakin' trip!

It's shovel, shovel, shovel!
An' it's sweat, sweat, sweat!
We're tryin' to cut the record
An' we'll do it yet,
While the draft would almost suck you
Through the furnace door,
An' the hungry grates is callin'
"Give us more, more, more!"

They packs us down in quarters that a Chink would hardly bear,
An' now an' then they condescends to let us breathe the air
(When the passengers ain't lookin' an' there ain't a soul to care;)
So we sweats our lives in service to the Line,
An' in payment for our labors we gits mighty little pay,
An' a bunch of rotten vittles that 'ud make you faint away,
An' the end is very simple—there's a little splash of spray
An' another stoker's buried in the brine!

It's shovel, shovel, shovel!
An' it's sweat, sweat, sweat!
It ain't no merry picnic
You can make that bet,
But we gotta keep the pressure
While the hot grates roar,
Their everlastin' holler
"Give us more! more! more!"

—Berton Braley.

SYSTEM OF DIRECT LOADING OF COAL CARS OVER THE TRACKS BY MEANS OF COAL HOISTING AND CONVEYING MACHINE.

WHY YOUR COAL BILL IS SO HIGH

By

GEORGE H. CUSHING

THIS is not written boastfully but that you who read may know I speak with some authority. I am and have been for five years editor of a trade paper devoted exclusively to coal. What that paper has to say about coal prices is accepted in every court in the land as prima facie evidence. At the minute this is written I am under subpoena to appear in court to testify as an expert upon market conditions and prices. With that as a foundation and with deliberate intention to make every word exert its full weight, I say that the householder—the unprotected buyer; the consumer of "domestic" coal—pays far more than his share of the cost of coal production. He pays all that his coal is worth, plus part of what the user of steam coal ought to pay. This means that he pays all the profits of the coal mining companies, all the cost of making sales, all of the increased wages of the miners, all of the cost of safety appliances in mines, all of the cost of workmen's compensation, all of the increased value of coal lands, and —he consumes not to exceed forty per cent of the coal. The user of steam coal pays no part of these things; he does not even pay the cost of producing that coal which he uses.

One day last October I made that statement while at luncheon with a group of coal operators. They knew the facts yet no one of them raised a voice to protest or deny. What adds some emphasis is that Dr. Joseph A. Holmes, director of the National Bureau of Mines at Washington, who was sitting next to me, put in significantly:

"That's true."

Only one operator said anything and his comment was no denial:

"I'll agree to that if you make the operator the partner of the householder. I'd say it this way: 'The householder pays all the increased cost of producing coal except what the producer involuntarily absorbs and all the profits of coal mines when there are any profits.'"

I accepted the amendment then and accept it now because it makes small difference. The main point here is that the householder pays so heavily, merely because the big industries will not carry their end of the load. Yes, I mean it—the people who own homes and must use coal or freeze, pay, along with their own bills, a considerable part of the fuel bill

of the railroads, the steel mills, the big factories, the electric light companies, et cetera and ad finitum. What is more to your liking, I will prove it before I have finished this article.

We hate winter—innately, constitutionally and cordially we hate it because it hurts us and would kill us if the coal man and his product were not at our elbows. We argue from the ill to the remedy and come to hate the cure as badly as we do the cause. We don't hate the man who sells us straw hats, light underwear, screens and electric fans, which means we feel differently about summer.

This natural passion of ours has been our undoing financially. At the behest of the paragraphers and the news writers we have come to believe that no coal man can be a Christian. On the contrary we imagine that every man who sells coal is inhumanly avaricious and unless watched will walk away with our earthly wealth. To see that he is kept in bounds we have all turned policemen, in which we are aided and urged by the newspapers. And, all of us think we are doing a wise and praiseworthy thing.

In the role of a policeman we naturally think of invoking the law. While on the trail of the coal man we naturally think of the Sherman act which inveighs against conspiracies to restrain trade. We believe that if we can prevent coal men from combining to put up the price, we are safe. Thus we are specialized policemen who, being sent for pickpockets, would not arrest murderers or porch climbers. In our specialty, we have no truckle with manufacturers, with steel makers, with railroads, or even with the banks and so they consolidate to their hearts' content. The result is that every other business is centralized, trustified and controlled from a central point; coal —outside the anthracite field—is as loosely bound together as chaff on the thrashing floor. You and I cannot complain about this because it is our own handiwork and if we pay it is our fault.

What we have done is easily understood even if not so easily undone. Centralized industry means efficiency—efficiency in buying as well as in production et cetera. Lack of organization means the reverse—it means no united or systematic effort to produce and sell scientifically. This means that a swarm of coal men flock to the offices of these big industries to sell them coal, only to encounter a cool-headed calculating buyer who follows machine methods and gets his coal at the lowest possible price. I need but make one or two suggestions to tell you what this means. The fuel purchasing agent of the Chicago & Northwestern Railroad told me that he buys 3,500,000 tons of coal annually for his great system. One man buys all the coal used on the 13,000 miles of railroad controlled by the Pennsylvania Railroad; and one man buys for

THE PRESENT SYSTEM MAKES OUTLAWS OF THE POOR.
Being compelled to pay the household price and a bonus because they can buy but a basketful at a time, they rebel and organized theft in railroad yards is the result.

the 12,000 miles of New York Central Lines. In fact, I am told by railroad men that the carriers of this country use 125,000,000 tons of coal annually or one-fourth of the total production and that it is all bought by not more than twenty-five men. On the average, then, one railroad purchasing agent, will buy 5,000,000 tons of coal per year. In placing such enormous orders, he receives bids and prices not from twenty-five coal companies but from at least 500. This duplicates the situation which enriched the oil refiner and impoverished the producer of crude petroleum; which enriched the American Tobacco Company and impoverished the farmer who grew the tobacco. It pits one buyer against a multitude of producers. In coal this has resulted in a situation which gives the centralized buyer his steam coal for less than it costs to produce it.

This is not merely theory pinned to logic; it is supported by facts and is the truth. For instance, to produce Illinois coal costs $1 at the mine mouth. The Great Western Railroad not long ago bought its supply from Illinois and Indiana mines for eighty-two cents a ton. The United States Steel Corporation used to have a contract with the Dering Coal Company of Chicago to furnish it 4,000 tons of coal per day at five cents a ton above cost. Then the Steel Corporation went to R. R. Hammond and J. K. Dering of that company not only demanding a surrender of that small profit but that the company should accept a loss. The Dering Coal Company refused and was forced into the hands of a receiver. To multiply examples adds no weight; a clear and authoritative statement of a fixed policy is better. I get it from Charles A. Lind, purchasing agent of the Commonwealth Edison Company of Chicago, who buys 3,000 tons of coal per day. He said plainly that if the time ever came when he had to pay as much for coal as the cost of production or more, his company would begin to operate mines upon the coal land which it owned. His reason for this is clear and

FRANCIS L. ROBBINS.
He organized the Pittsburgh Coal Co., which has proved that amalgamation of companies in the bituminous coal field cannot standarize prices. On the contrary, its temporary success complicated the disorder in two years.

CARL SCHOLZ.
He organized the McAlester Fuel Co. to equalize prices and when that was broken up by the Government he helped to introduce the American Mining Congress into the coal fields. That association is now struggling for the same goal.

easily understood and I will let him give it:

"Coal is our raw material and if any profit is to be made on it by any one, our stockholders can use it as well as the stockholders of the coal company."

Then Mr. Lind added a word or two which explains his own attitude and that of every other centralized coal buyer. He said:

"I know what this thing means and I'm sorry, really sorry. However, you can't blame me for buying coal as cheaply as I can. Whether you do or not, that is the purpose for which I am hired by this company. If I can't get it cheap enough they will get some one who can. If, under this system, I get coal for less than cost it is only business."

Mr. Lind is right. It is business and what he does is the natural thing under the existing system. You and I made the system and you and I pay the piper. With this situation made clear, it requires no wizard to explain why we pay. All business concerns itself solely to make a profit. Coal companies are business units—not eleemosynary institutions—and exist solely to make a profit. If they do not get it off one thing, they get it off another. If, as a result of your and my vigil, coal companies are prevented from organizing while all their big customers are uniting or have united, it stands to reason that steam coal is at the mercy of its users and that the users put on the screws to their own advantage. That gives the coal company no hope of profit from that source—but it must have a profit. You and I are not trusts and so we who buy small lots come in handy. We are not centralized buyers and can't beat down the price. For that reason we must make up the loss and supply all the profit. And that is precisely what we are doing. Upon every ton of coal delivered to your cellar and mine is put a price which gives the producer what he lost on his big steam business and what he ought to have and will have as a profit on his total production.

R. R. HAMMOND.
He was president of the Dering Coal Co. which was crushed by the United States Steel Corporation. He was one of the financial sponsors for the Sterling Coal Co. which was ruined by an assault made by the big users of steam coal.

To make this clear, I will transcribe from the columns of the coal trade paper of which I am editor, a few current market prices.

It costs $1 a ton to produce the so-called smokeless coal coming from West Virginia. The "slack" or small coal which is used to make coke for the steel mills and blast furnaces is selling for fifty to sixty cents a ton; the domestic lump is selling for $2 to $2.25, on board cars at the mines.

It costs about $1 a ton to produce Franklin county, Illinois, coal. The "screenings" or small sizes sell for sixty to eighty cents a ton; the domestic lump is bringing $1.75 to $2.

It costs $1.10 to produce Hocking Valley coal in Ohio. The slack is selling for eighty to ninety cents a ton; the domestic lump is selling for $1.50. (The spread there would be wider but for the fact this coal mines—under rigid discipline of the miners—with a greater percentage of lump than in other fields. Having more lump to sell, the producers can recover their loss on the steam coal without any excessive burden being put upon the householder.)

I prefer not to burden your mind with figures which are duplicates. The fact is enough and the fact is that the

"domestic" price, at the mine, is from two to four times the steam coal price—*at the time the householder wants it.* And, whether used for steam making or in the house, it all has the same heat producing power. Intrinsically there is no difference in it—no practical difference. The steam coal comes down from the seam with the same shot that brings down the domestic coal that is made up of the large lumps; the steam coal consists of the small sizes and the dust. The coal is the same and—in some circles it is conceded I know something about combustion—the mixture of small lumps and dust burns better than large lumps.

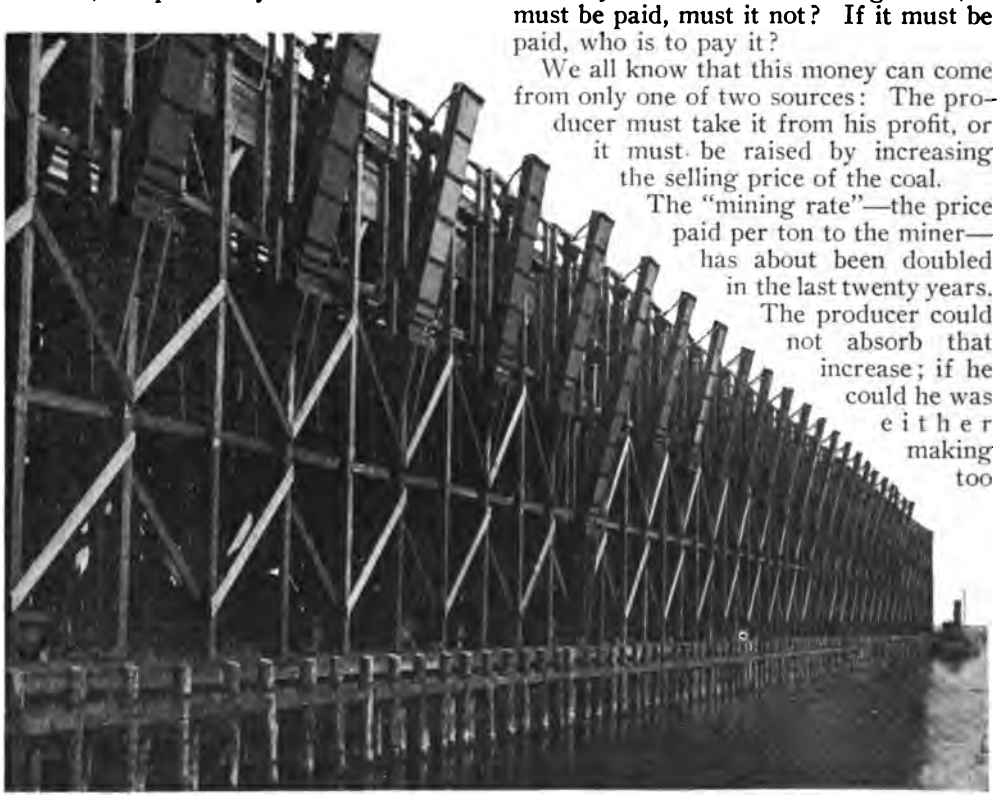
Resting upon the foregoing statements alone, I might lay claim to having made my case. But, I have just begun for the reason that new developments in the coal field have just begun to lay their hand heavily upon the householder. As matters now under consideration come to fruition, the price of your coal and mine must go up—unless something is done. I name a few of these things and compute their cost to you and to me.

The American miner today works only 180 or 200 days in the year. This is so because the competition upon which you and I have insisted has caused so many mines to be opened they cannot possibly be worked steadily. Still, the miner must live whether he works 180 or 300 days in a year. As a consequence, he must get for his 180 days as much as another workman gets for 300 days or thirty-three and one-half per cent more per day than the man who is steadily employed. Now, the miner is complaining that his yearly income is not enough. He knows it is useless to ask for more steady employment, so he asks instead an increase in his "mining rate." We will say that he asks for ten cents a ton and compromises on seven and one-half cents or five cents.

If any increase whatever is granted, it must be paid, must it not? If it must be paid, who is to pay it?

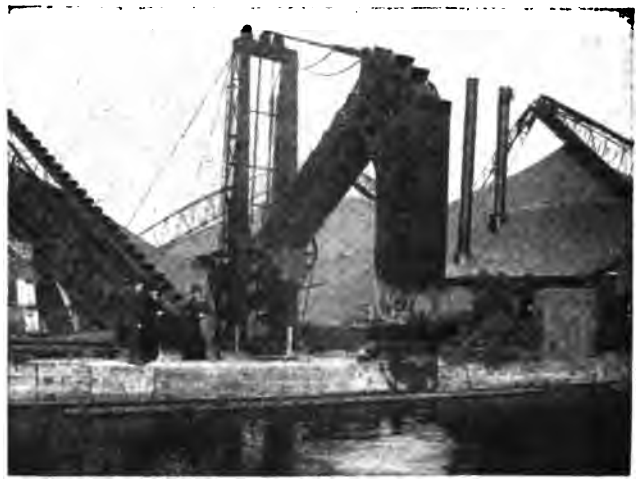
We all know that this money can come from only one of two sources: The producer must take it from his profit, or it must be raised by increasing the selling price of the coal.

The "mining rate"—the price paid per ton to the miner—has about been doubled in the last twenty years. The producer could not absorb that increase; if he could he was either making too



A SHIPPING PIER OF THE BALTIMORE & OHIO RAILROAD AT TIDEWATER.
This is an expensive modern device for transferring coal from cars to ships. It must make a profit: interest on the investment in it must be paid; the operating cost must be met. This is all charged against the coal—the domestic coal.

much money in the first place or is making none now. It is out of the question to assume that the producer absorbed this increase. This means it was paid for by us and the steam user. The price of steam coal has gone down rather than up. Railroads which used to pay $1.12½ to $1.15 for their coal are, right now, getting it all the way from eighty to ninety-five cents a ton. The official figures for Illinois show a reduction in the average selling price of coal of fourteen cents a ton in eleven years.



A MODERN STORAGE PLANT.
Few single coal-producing companies could afford this expensive outfit. If two or more companies united to build it, they would violate the Sherman Act.

This measures the decrease in the price of steam coal. That is, the reduced price on sixty per cent of the output—the steam coal—was enough to reduce the average price of the whole fourteen cents a ton. In a struggle to make up this loss and also pay the higher wages to the miner, coal prices to you and me have gone up swiftly. In 1910, by way of example, Springfield, Illinois, lump coal was selling for $1.25. Illinois operators gave the Illinois miners an increase of seven and one-half cents a ton. The price of domestic coal immediately thereafter went up to $1.40. That was an increase to you and me of fifteen cents or seven and one-half cents for the legitimate rise due to the concessions of the miners and seven and one-half cents to make up what the producers knew they could not collect from the steam users. If the miners are given any new concessions, you and I will pay in like proportion.

Here is another coming burden upon our purses.

In almost every state the question of compensating the families of those who were killed in the mines is being agitated. At Cherry, Illinois, in 1909, a great mine fire caused the death of about 300 men. To the heirs of these men the St. Paul Coal Company paid $1,500 each. In Germany, systematic settlements of such claims costs two cents a ton on all coal produced. Illinois has passed a law providing for such systematic settlements and this will mean an addition of two cents a ton to the cost of producing coal. The charge is justified and must be paid. But, who is going to pay it?

The steam user fixes his own price and will not pay an increase. Just now the Illinois operators are absorbing it but they can't absorb everything. It will, ultimately, be passed on to you and me. And, when it is passed on, it will not be merely two cents a ton, or our just share; it will be four cents a ton—unless something is done. It will be the two cents a ton which we naturally should pay as coal users plus two cents a ton which we pay to relieve the steam coal user from his obligation.

I will give you a third burden.

For the protection of miners, state legislatures are now demanding that fire fighting apparatus be installed in mines and that the producers shall maintain well drilled first aid corps. These things with other safety appliances and their maintenance will cost—I am following Germany's actual figures—at least a cent a ton. To you and me it means two cents a ton—our own one cent and the one cent which we pay to relieve the steam user.

Permit me to cite a fourth burden.

In the halls of Congress, men are talking about conservation of coal. Under present methods, producers recover only, on the average, sixty to sixty-five per cent of the coal in the ground; forty per

RECOVERING COAL FROM STORAGE.

Anthracite coal companies are able to make uniform prices because they have the capital with which to store the surplus until it is needed. In this device the coal is scraped down from the pile upon this conveyor which carries it to the reloading plant.

cent is left unrecovered and unrecoverable. Conservation demands the recovery of that undisturbed forty per cent, and soon we will have a law demanding it. That law, for the protection of this nation, should be passed tomorrow morning because our coal is all too rapidly disappearing. However, to get that extra forty per cent, will add ten cents a ton to the cost of producing *all the coal.* Being a just charge, it should be paid. But who is going to pay it? The steam user is so fortified in his position he does not have to pay. Therefore the burden, when it comes—unless something is done—will fall upon you and me as householders. And, we will have to pay our own ten cents and the ten cents by which we will graciously relieve the steam user of his burden. The total cost to us will be twenty cents a ton additional for our domestic coal.

Permit me, if you have the patience, to cite a fifth illustration, and I might add a sixth and a seventh.

We have about worked out the "surface" veins of coal in all of those producing centers which are near the market. Hereafter, we must go deeper for the coal; we are mining coal today at depths ranging from 500 to 1,500 feet. This costs more money, naturally. Who pays that increased cost? Not the steam user because his price is not an advanceable proposition. You and I pay it; it is a burden on the householder. I cannot measure it in cents for it is variable.

While dissecting this subject, I want to bring out one more point. Personally I have the very opposite of any quarrel with the miners' union or, for that matter, with any other union. I like them and I think—if my opinion amounts to a bean's weight—they are fine things for industry and for the nation. However, the miners are human; they prefer the road of least resistance. They find that powder will get down coal easier than they can pick it down by hand. Blasting powder is a brainless force and is no respecter of substances. By making the powder do the mining, the miners are shooting the coal to pieces; they are making an increased quantity of fine coal to be sold at a loss and a decreasing quantity of lump coal to be sold to you and

me at a big profit. That increases your and my burden. It must increase our burden if we must use lump coal and if lump coal only bears the manifold burdens of mine expense.

The skeptic arises to scoff at my logic. He asks me what has become of the economy of production in mines arising from the introduction of labor-saving devices and arising from the increased size of the mines. I answer him by saying that the price of domestic coal has not risen enough to account for all the increased expenses. I answer him by saying further that coal producers on the average are no longer making any profit. Thus the increased economy in coal production and the surrender of profits by the operators have merely gone to soften the blow upon your purse and mine.

However, the fact remains that you and I should have had smaller fuel bills as a result of this very economy of production. We did not get them but instead are paying and will continue to pay higher and even higher prices—unless something is done. As I showed, though, the steam user is getting lower prices. He profits by the economy and by the enforced competition; you and I and the operator of the mine stand the brunt.

Under the circumstances, the operator, who is a joint sufferer with you and me, is our partner in this affair. Anything which you and I may decide to do, he will go with us; he even wants to lead and will lead if we will but permit him. You ask why he has not done something long ago. He may be dull but having tried many things has found that the only efficacious way is some sort of an agreement as to output and relative prices—you and I are self-appointed policemen to see that he does not agree on either. The newspapers are our allies in this vigil; they would throw spasms of ink if any such thing were attempted.

Nevertheless, some efforts have been made along the line of equalizing prices and one after another they were killed by us policemen. About three years ago, I was in at the death of the McAlester Fuel Company of Oklahoma which was trying to equalize and standardize prices. The Interstate Commerce Commission got wind of it and advised that the arrangement be broken up. Then Governor Haskell of Oklahoma went out upon the trail of the operators and has been after them ever since; he is a very busy policeman who insists that the way to help the householder is to saddle this system upon him permanently. The prime movers in the McAlester Fuel Company were Carl Scholz and William Busby, Oklahoma operators, who yielded to the law's persuasions because they preferred business suits to stripes. I know both of them. I have spent literally days with Mr. Scholz trying to find some legitimate way of easing this burden on the householder's purse.

About that same time, in Chicago, I also attended the obsequies of the Sterling Coal Company. It was organized for the sole purpose of increasing the price on the steam coal produced in Illinois and Indiana, that the domestic coal price might be reasonable. The fathers of that movement were G. W. Traer, R. R. Hammond and J. K. Dering. Their hopeful project was killed not by the law—it never got that far—but by a league of the big steam users who knew what its success would mean to them. Their method was cunning. The Sterling Coal Company intended to "corner" steam coal and thus force up the price. The steam users, to crush the intended corner, bought lump and crushed it down to their

ANTHRACITE COAL IN STORAGE.
This is a sample of the Dodge System of coal storage. Such a plant will cost from a million dollars to ten million dollars. Few single companies could afford such a device.

size. One winter of this practice was enough; the Sterling Coal Company died of financial starvation. I know all of these men well. They are not criminally inclined; they want to do the square thing. But, they can't—and weren't permitted to do it.

I have a recollection of a meeting of the Indiana and Illinois operators last spring to attempt to reach some understanding as to how prices might be equalized. I recall the virile and assertive stand taken by Walter S. Bogle. At one end of Mr. Bogle's forty-year career stands a wheelbarrow; at the other end a position as the leading operator of Indiana and Illinois. He did not climb from the wheelbarrow to the role of the manager without some vigorous fighting and all the fight in him rose to the surface when he talked of this subject. I remember his defiant declaration:

"We will agree legally if we can but we are going to agree."

A RETAILER'S DELIVERY OUTFIT.
The owner of it has no responsibility for existing conditions, yet this simple thing has become a veritable instrument of torture to many.

There were men in that room who had been within the purview of the grand jury and they did not follow Mr. Bogle, so nothing was done. I have talked on this subject with Mr. Bogle. He wants what I have outlined here—to equalize prices.

Going further back and drawing an illustration from history: I remember when the Pittsburgh Coal Company was formed to do exactly that one thing—to equalize prices. Since the law would not permit any agreement, as to production, this company started out to buy all the producing mines in the Pittsburgh district. The leader of that movement was Francis L. Robbins, a genius of a kind, now dead. That company began to standardize prices and to make a little money. In two years, the competition upon which you and I insist had duplicated the output of the Pittsburgh Coal Company, by the opening of new mines. By that one thing, the old system was fastened more tightly about our necks—yours and mine—and all efforts to solve the problem by amalgamation of existing companies was given up. We who know coal know that prices by amalgamation cannot be standardized without an outright monopoly of all available coal land. That, seeing the amount of available land, is impossible.

In my time among coal men I have heard Tom L. Lewis, then president of the Miners' Union, try to shame the operators into some kind of action for their own protection—and for yours and mine. I have heard him say:

"You men are cheap, cheap, cheap. You let the steam users of coal take away your capital and your birthright without raising a hand to protest. Why don't you organize the way we miners are organized?"

That taunt of Mr. Lewis that hot summer day at St. Louis never caused a ripple. The operators saw the need for organization but between them and the goal they saw the Sherman law and—you and me as policemen.

Again at Cincinnati, in 1910, I heard Mr. Lewis thus tantalize the operators:

"You men stand together about as firmly as a rope of sand. You talk boldly in meeting and then the traitor in your ranks comes to my hotel at midnight and offers to sell out the whole of you. You have no organization with which to punish that fellow as we miners would do."

And again the specter of the law and the policemen; the operators sat still and bolted that truth. They could do nothing.

If the operators were given the right to agree—under proper supervision? G. W. Traer said to me not long ago:

"If the steam coal price were marked up, the domestic price could be marked down, now; the householder would get the benefit, in future, of mine economy."

Dr. Joseph A. Holmes, director of the Bureau of Mines, agreed with him.

Harry N. Taylor, president of the Monon Coal Company, president of the Illinois Coal Operators' Association and president of the American Federation of Coal Operators, before the meeting of the American Mining Congress said:

"The householder pays too much for his coal because the steam user pays too little. Equalize these prices and we can reduce the householder's price and still make all the improvements in mining conditions the public demands."

I have, in the hearing of men who know the coal business from the bottom of the shaft to the ash pit, made this statement without being contradicted:

"If coal prices could be equalized, it would be possible, at once, to take fifty cents a ton off the price of the domestic coal at the mine mouth; grant workmen's compensation and old age pensions; put safety appliances in mines; recover all the coal left in the ground; and still leave the coal as rich as the oil business."

In drawing this down to a practical suggestion, I want to show how easily the whole situation could be turned end to end. To make my point clear, I will ask the uninitiated to dismiss from their minds, once and for all, the notion that steam coal and domestic coal are different products; they are one and the same thing in all save the size of the pieces. Coal in the ground is a solid black rock. It is shot down with blasting powder. The large lumps and the fine lumps are carried to the surface in the same mining car and go together upon a chute which leads to a screen. The fine particles which fall first through the screens constitute the steam coal; the large lumps which pass over the screens constitute domestic lump.

However, you and I do not burn coal in summer; the steam user takes his coal the year around. When, however, the coal producer is mining the requisite amount of steam coal in summer, he also mines perforce a proportionate amount of domestic lump. The question is: What to do with that lump coal until we are ready to take it? Also, in winter when he is getting out all the domestic coal we want, he is making too much steam coal or more than the steam user wants—just at that minute. What is he to do with that surplus?

You say, naturally and truly: Store the surplus until it is needed, as any business man would do. But—one dock to store coal will cost a million dollars; some storage plants in the anthracite field cost as much as $10,000,000 to $15,000,000 or even more. It would seem easy for the coal producers of a given field to build these docks and store our domestic coal until we wanted it and then use the same space upon which to store the surplus steam coal until it was needed, thus enabling them to equalize the price. It seems strange they have not done it long ago. You forget, however, that this would regulate the price and that an agreement to regulate the price contravenes the Sherman act.

But suppose we gave the coal men the right to agree? What would happen? The coal men, instantly, would build those storage piles and then forget about the seasons and the influence of cold weather. Domestic prices would not go up every time the thermometer went down.

The biggest change would come in this: Mr. Lind said that the big steam coal users would never pay the coal man a profit, and I believe him. The Commonwealth Edison Company has enough coal land in Illinois to last it for the next 100 years. The International Harvester Company has 14,000 acres of land in Kentucky and 20,000 acres in West Virginia. The United States Steel Corporation owns about all of the Connellsville field of Pennsylvania and has something like 200,000 acres of coal land in southern Illinois. Every coal carrying railroad has control either of virgin coal land or of coal-producing companies. One and all, these big buyers of steam coal would desert the commercial coal companies which they now patronize and would start to develop their own property. There would be a rapid and radical readjustment of coal sales by which the steam coal price would be freed from the downward pressure of these powerful buyers. We would have a realization that it is as much against the common good for a coal producer to sell one man his coal at a lower price than is charged another as it is now against public policy for a railroad to give one man a preferential freight rate.

THE HEALTH OF THE CITIES

By

F. C. WALSH, M. D.

SUPPOSE little Johnny, your sole son and heir, were taken desperately ill in the middle of the night.

"Never mind, dear," you say, to quiet the mother's alarm. "Don't be frightened. I'll send across the street for Jones, the cigar-maker. He's a good fellow, a hard party worker, controls the Third Ward."

Or suppose several members of your family successively come down with typhoid. With astonishing perspicacity you begin to suspect that sanitary conditions are bad. Send for the amiable cigar-maker again! Turn the situation over to him!

Idiotic! Of course. But what no sane individual would dream of doing a city of 50,000 presumably intelligent people actually did! They hired a cigar-maker to see that they were protected from the ravages of measles, diphtheria, typhoid, small-pox and tuberculosis! Inevitably the death-rate was needlessly and wickedly high. Hundreds of little children, adult men and women in their prime, were sacrificed to the common stupidity and ignorance.

The city which put a cigar-maker in charge of its health department was Springfield, capital of the great state of Illinois.

But Springfield's citizens were no more open to blame,—nor was the unfortunate cigar-maker,—than are thousands of others who are living in a state of dangerous bliss in various cities scattered throughout our country. Those worthy citizens of the Illinois city didn't know that anything was especially wrong; no one had taken the trouble to arouse them to a knowledge of their plight, and the instance is here used merely as a horrible example.

One main trouble with Springfield was that it had never thought it necessary to have a medical man in charge of its health-office. Of course it would have been very much surprised indeed if a cigar-maker had been forced on its shoulders to occupy, say, the position of city attorney. That would have been a bitter pill,—or a "horse of another color," as the Cigar-Maker City Doctor might have aptly said, for he was a "good-fellow," and as wise as the average of his kind. Before he took office the death-rate was high; after he entered on his professional duties it continued to soar, with an alarming number of cases and deaths due especially to typhoid,—but still no one so much as dreamed that anything was different from what it should be; everybody was used to it, and the city slept! No, one man was awake, though he has little to do with this story. In talking to me about the situation, he told me he thought it was all due to some peculiar, local, climatic influence! I don't know what his condition was, but I will say right here that Springfield's deplorable plight was largely due to the three most baneful influences of American city life,—ignorance, self-satisfaction, and politics!

Springfield has come to its senses, but its story is well worth following a little further as an illustration of what may and does occur in almost any one of our cities, from the metropolis down to the remotest of villages. But to continue, Springfield was sleeping. And then, somehow or other, by one of those rare chances of fortune, a medical man happened to be appointed to look after the city's health. There was much to be done besides mere drawing a salary; the situation required a good deal of head-work and the bringing to bear of expert knowledge. The appointive Power recognized this by making the salary of its first and only medical health-officer equal to that

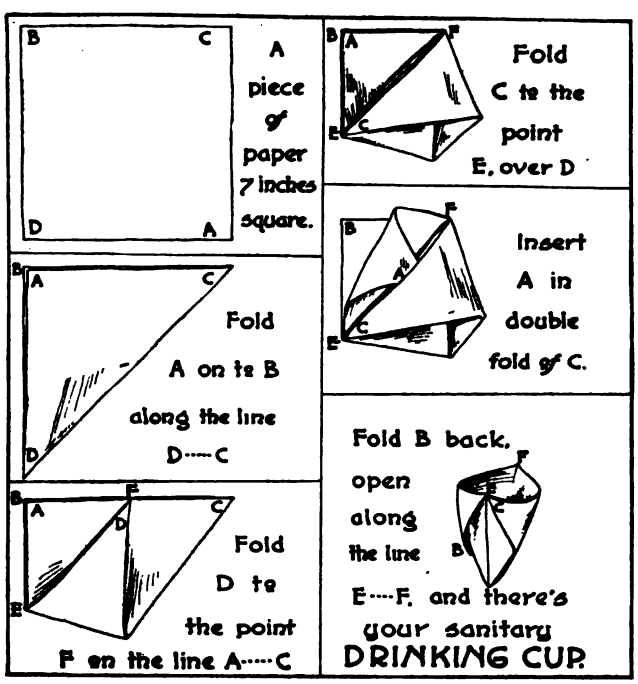
of the police patrolman, who measured up to his office by sheer weight in pounds avoirdupois, and the requisite height when measured in his stocking feet!

But this new health-officer, this man who made the story of Springfield worth telling, went to work at once systematically, not knowing, however, just what he was going to find, and he himself was the first to awaken to the real truth of the situation.

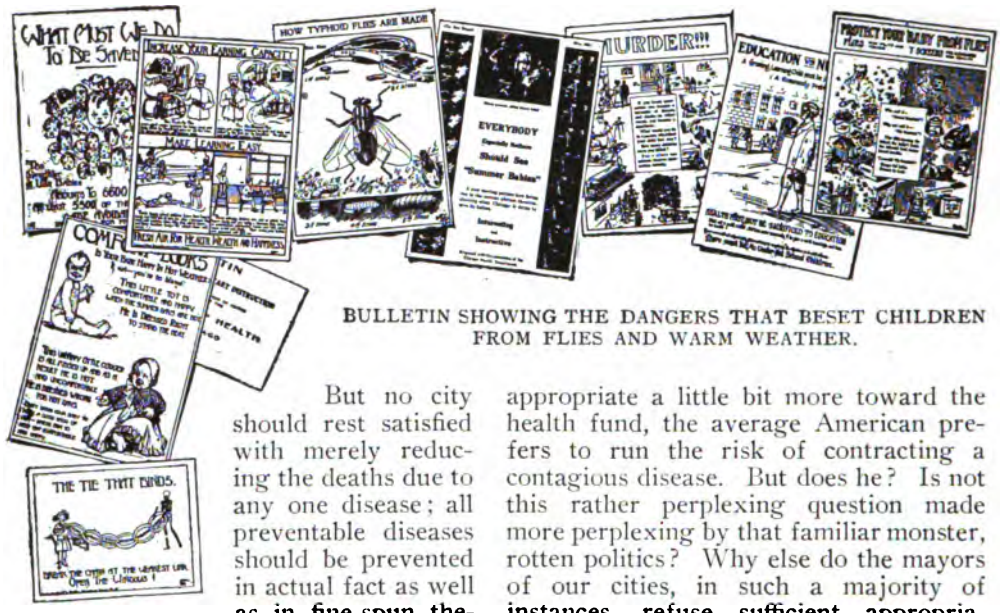
He first turned his attention to the city's water-supply, and found it good. There was no typhoid from that source. Then he did something which no one before had thought of, and certainly the cigar-maker would have required more than the inspiration of a good Havana if he were ever to think of such a thing. With untiring patience he carefully plotted out on a map the location and source of water-supply of every house in Springfield, and then began to work on the resulting figures. The consequences were startling and of tremendous importance to at least two-thirds of the city's dwellers. City officials, and others who were supposed to know, had long thought that about seventy per cent of Springfield's dwellings obtained their water from the city's source of supply, and that about—be it understood,—the same per cent of houses were connected with the city's system of sewage. For years they had been harboring this delusion. But the facts fell wildly short of this vague estimate, and that's an important point, for instead of seventy per cent using city water, it was found that two-thirds of the dwellings used water from wells on or near their own premises, and instead of sewage connections, it was learned that these two-thirds were making use of obnoxious cess-pools. The taxpayers had put in a system of water and sewage at a cost of $400,000, and only one-third of the population was profiting from this outlay! But this is a health story, and we must come to the point. It was quickly discovered that a large proportion of these cess-pools were contaminated with typhoid, and, horrible fact, were draining into adjoining private wells!

This condition had evidently existed for years, unknown to any one, and Springfield was properly shocked when the facts became known. But the source of the high annual death-rate was explained, and action was taken to remedy the malodorous conditions as quickly as possible.

But to their credit be it said, the people of Springfield did not try to hide this blot on their 'scutcheon; on the contrary, they acknowledged their negligence, voted thanks to the man who revealed the objectionable conditions, and were glad to know where their weakness lay. As a consequence of this awakening from a long sleep, the death-rate has diminished to a surprising extent, and the city has become alive to other health needs.



How to Make a Sanitary Drinking Cup.
One of numerous helpful bulletins issued by Chicago's City Health Department.



BULLETIN SHOWING THE DANGERS THAT BESET CHILDREN FROM FLIES AND WARM WEATHER.

But no city should rest satisfied with merely reducing the deaths due to any one disease; all preventable diseases should be prevented in actual fact as well as in fine-spun theory. In other words, there is no excuse nowadays for a city's population being afflicted with epidemics like diphtheria or typhoid. And yet Chicago, as an instance, had 792 deaths from diphtheria for the year 1911. Could these deaths have been prevented? Undoubtedly, if antitoxin could have been administered on the first day of the disease. The effectiveness of this remedy was proven by the records of the Philadelphia Hospital for Contagious Diseases from 1904 to 1910. During that time antitoxin was administered to 256 on the first day of the disease. All recovered! Why can't Chicago, why cannot other cities, show results as brilliant as this Philadelphia record?

The obstacles are many. The people themselves are often to blame, either through ignorance or a lack of interest in their own welfare, or both. Then again, health-officers, even medical ones, are occasionally incompetent, and sometimes gain office through skill in politics, while the funds at the disposal of the worthy ones are far too often sadly insufficient. We will pay for police protection; we will perhaps more gladly pay for fire protection; but we—or is it our neighbor—seem to have a natural aversion to pay for health protection. It resolves itself into this: rather than pay a little bit more, or urge the officials to appropriate a little bit more toward the health fund, the average American prefers to run the risk of contracting a contagious disease. But does he? Is not this rather perplexing question made more perplexing by that familiar monster, rotten politics? Why else do the mayors of our cities, in such a majority of instances, refuse sufficient appropriations? Is it because they are pledged by tradition to look after job-seekers, and by past customs in politics they are bound to find places on the pay rolls of the police and fire departments for the friends of influential henchmen? Perhaps no,—perhaps yes! At any rate, according to a bulletin recently issued by the government, the appropriations for forty-seven cities were as follows:

	No. employed.	Amt. appropriation.
Firemen	4,899	$4,632,497
Policemen	4,822	4,262,322
Health Inspectors..	247	842,842

These figures tell their own story, and show the relative importance the average city official places on property protection as compared with health protection. These figures are the total of forty-seven cities with a population of between 50,000 and 100,000 each.

In Chicago medical inspectors receive $66.66 a month, while the salary of a police patrolman is $1,320 a year. The salaries of plumbing inspectors were recently raised from $1,440 to $1,716 a year. The hundred or more medical inspectors petitioned a short time ago for a raise from $66.66 to $88.88 a month, and a rumor got afloat that they would strike if they did not receive the raise. This rumor reached the ears of Mayor Harrison. "Let them strike," he is reported

to have said, "these positions were created for medical students just starting out. No one supposes that the positions are high salaried ones, and no one supposes that a doctor who can't make more than $66 a month is much of a physician." By the same token apprentices should suffice for plumbing inspection! But the mayor's remark would seem to indicate that a city's health was not of sufficient importance to pay more and get better men. Perhaps that attitude of mind explains the 792 deaths from diphtheria in Chicago for the year 1911. The fact is that an epidemic of diphtheria was raging in Chicago at the time the alleged remark was made!

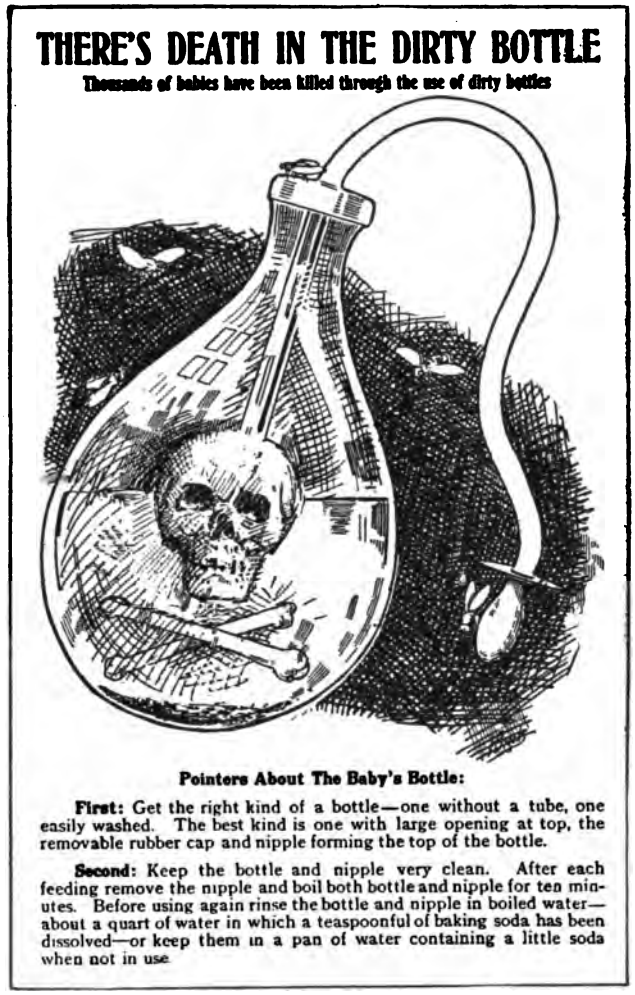
And yet hundreds of thousands of lives and millions of money could be saved every year by attacking disease on scientific principles. Millions of money! Just so, for disease is expensive, not only to the individual, but to the city and state as well. We are compelled to take care of the sick and indigent after they have become diseased and helpless; we are not unwilling to build hospitals and asylums for the insane and incurable; but,—strange fact—we do not like to spend sufficient money to keep them out of these places by averting disease by proper public health precautions. We are liberal enough after the horse is stolen, but too cheap by far to buy a lock before the deed is done. Health can be counted in dollars and cents, if it must be counted in that way.

Money still talks. Show a man how to save his health and he is apt to turn a deaf ear; show him how to save a dollar and watch him listen. Mr. Brandeis recently showed the railroads how they could save millions of dollars a day, and the world sat up and took notice; another man, in the name of that magic word,—Efficiency, told us a short time ago how we could make one brick-layer do the work of two, and everybody but the brick-layer threw his hat in the air. But how are we going to make a man efficient if he is half-sick half of the time? Won't this half-time sickness just about discount his newly discovered double-efficiency? If we must have efficiency, well and good, but let us be sensible about it and begin at the bottom of things, for the shortest road to efficiency is good health, and it is the duty of city and state to conserve that.

To what extent are the cities making good in this respect? Let us take the matter of pure food,—the subject is not yet a dead issue! For in spite of the protection which the pure food law is supposed to exercise over the welfare of the people, conditions relating to it are far from perfect. Many big companies have been fined during the past year for comparatively slight offenses. But it is not always the big fellows who are the most guilty. The little fellow is harder to watch, and his offense is often more serious. Sometimes he is able to evade the law. And so it follows, that if the big fellow is a national problem, the lesser one is more often than not a problem to be solved by the city itself.

As there were more violations of the Federal food law in Illinois than in any other state during the past year, Illinois' chief city is therefore selected to illustrate the smaller offender. Chicago contains manufactories whose deplorable condition is almost unbelievable, and there is plenty of authority for any presentation of examples in this regard. John B. Newman, assistant food commissioner for Illinois, had the following to say in recently commenting on the situation: "In the Greek district of Chicago a dealer sells cotton-seed oil for olive oil. In the Greek language he calls it olive oil. In English he labels it correctly, because his Greek customers cannot

A SERIES OF WARNINGS TO PARENTS.
Suggestive measures to prevent blindness, preserve health and save lives.



PARENTS ARE BEGINNING TO HEED THIS HINT.

read the language. Thus he complies with the law and fools the Greeks." But the following is a far more serious offense. "We visited a mince-meat factory," he said, "and found that the only ingredients were currants, apple-peelings and suet. The currants were kept in bins alive with white worms. We asked the manufacturer how he got rid of the worms. He said he soaked the currants in boiling water and that the worms came to the top and were skimmed off." In another instance the inspectors went to a tomato factory where catsup was made. They found that the stuff was composed of tomato pulp, apple-peelings and water, the bulk of which was soaked up with corn meal, and the whole mess preserved with benzoate of soda. The dirt over the entire floor of this factory was an inch and a half thick!

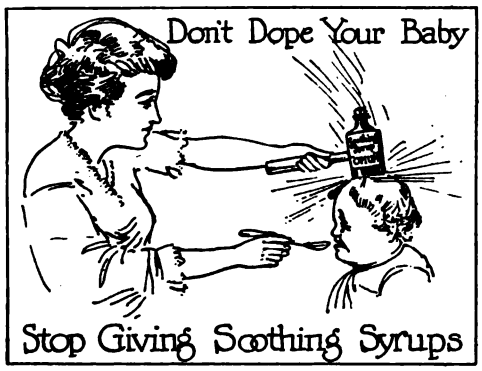
The city of Boston recently lost a case in the courts in which it was trying to enforce a very good ordinance in favor of pure milk. As a result of this adverse decision, Bostonian babes yet unborn will lose their lives through feeding on filthy milk, laden with tubercular and other death-dealing germs, while even adults will swell the death list as victims of typhoid. This is an instance in which flimsy laws often work against the greater good.

Corrupt political influence also shows its evil claws in this problem of the health of the cities. It has no respect for such sacred matters as life and death. In St. Paul, for example, this ghoulish influence has permitted dairies condemned by the health department to continue in business, unrestrained and unmolested. And in the same city this familiar disintegrating force has more than once retarded legislation which would have secured for the people more favorable sanitary conditions. Not long ago an ordinance for bottled milk was agitated. The health of the city would have gained by its passage. But the health of the many was permitted to continue endangered by the interests of the few,—namely, the milk-venders. In the opinion of the health-commissioner, the passage of the ordinance was hindered by unfavorable political influence. "Of course," he remarked, in speaking on the subject, "bottling dirty milk does not make it clean; but bottling clean milk does keep it clean and removes the great danger of contamination by handling after it leaves the dairy, and even bottling of filthy milk prevents it from

becoming more filthy." In passing, it must be put down as a disgrace to a city like St. Paul that it has in this enlightened age paid its health commissioner the same salary as it pays the collectors of dead animals, while his assistant receives just a little more per day than does the garbage collector.

POINTERS FOR SECURING PURE MILK AND ICE CREAM FOR THE FAMILY.

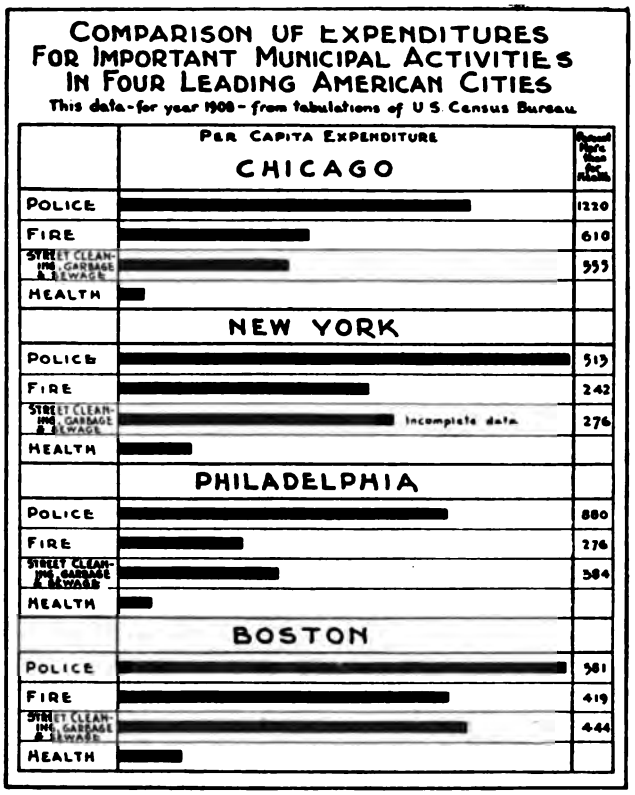
Two years ago a young man was made health-officer of the city of Wheeling, West Virginia. The doctors were very busy just then, and so were the undertakers, because of an unwarranted rate of death among the infants of that city. It was a sort of "race-suicide," but on a mammoth scale. The new health-officer was shocked and dumfounded as he read over the long death roll. The milk supplied by the venders at once fell under his suspicion. Then he looked up the law. Too often health boards and officers are tied hand and foot by a lack of authority, but this Wheeling progressive felt sure from his interpretation of the law that he had the power to put a stop to this heedless sacrifice of infant life. He began by examining samples of milk sold in the city, and then it dawned on him that this course would be useless if he stopped at merely entering the results in his book of record, so he decided to make the facts known to his employer,—the people. When this became known, there were vigorous protests and dire threats of violence from the parties interested financially, but he went ahead in the face of this stormy antagonism, and printed the results of his inspection in the columns of the daily press. The list of guilty venders was a long one, and its very proportions startled the citizens from their costly slumber. But the efforts and results were worth while. Today Wheeling has a uniformly good milk supply, for the people avoided the venders of dirty milk as they would the plague, and the venders whose names appeared among the undesirables in the printed list, were forced to mend their ways or go out of business. Now the little white hearse is seldom seen on the streets of the city of Wheeling. Even adverse advertising pays.



A DOSE OF A "SOOTHING" SYRUP IS THE SAME AS A BLOW ON THE HEAD.

Easton, Pennsylvania, is entitled to a blue ribbon on the score of its method of dealing with tuberculosis among the poor. It is a widely known fact nowadays that besides fresh air, proper and nourishing food is one of the chief essentials in building up the tubercular victim and bringing him back to health. Cream, butter and eggs have a high value in this respect, but where is the poor or poverty-stricken victim to obtain these? For in a majority of instances these unfortunates are of the poorer classes, and have a difficult enough struggle against the odds of life when in full health. But let them once get into the clutches of the white plague, and they will stand little chance of recovery unless supplied with proper nourishment in abundant quantities. Easton realized this, and so far it is the only city in the entire country which has solved this phase of the dark problem of tuberculosis. Easton, with

arms laden with generous quantities of cream, butter and eggs, goes right into the homes of the needy tubercular victims, and supplies all tubercular victims with rich, bounteous provisions. It discriminates between charitably saving the starving and re-building into new life the shattered frames of the tubercular. The only requisite necessary to obtain this richest of nourishment is a physician's certificate, stating that the bearer is a victim of the white plague. This plan is better and cheaper than hospitals, of which enough will never be built to supply the demand so far as tuberculosis is concerned, and other cities which wish to rank foremost in health activity would do well to follow Easton's lead.

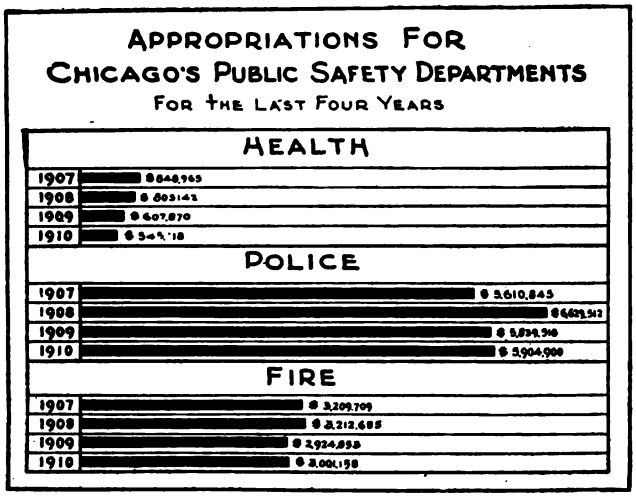


EVIDENTLY HEALTH PROTECTION IS NOT REGARDED AS BEING SO IMPORTANT AS PROTECTION OF PROPERTY.
A comparison of budgets of four of our great cities.

In this limited distribution of medals to cities for achievement along health lines, Cincinnati must not be forgotten. There are to be no more "blue Mondays" down there on the Ohio, and henceforth washday will cease to be the abomination of desolation for the poorer families who are fortunate enough to live in Cincinnati. That city's health board is entitled to the credit for carrying out the idea, for they fully realized the dangerous consequences often due to damp, steaming clothes hanging to dry in the close quarters of the dwellers of the tenements, and had the foresight to see the sanitary benefits of a city public laundry. So the laundry was built, and was just recently opened to the women of the crowded tenement districts. This novel city plant includes enough driers, washers and electric irons to meet the laundry needs of five hundred families every week. It has proved to be such a success that Cincinnati is getting ready to build more of the same kind.

Performances like this, and of some of the other cities mentioned, benefit a city even in a financial way, for good health and a low death rate are two of the best advertisements that a city may have. The more enterprising of our cities are learning this, and are waking to the fact that to grow in population and prestige it is not only necessary to attract new citizens, but even more necessary to preserve the health of those they already possess. Just as the insurance companies are realizing that it is more profitable to keep their policy-holders alive and paying premiums than it is to let them die, so some of the cities are having it forced on them that a healthy man, woman or child is a real commercial asset to any community.

But it must be said to the shame of most of our cities that they have not more fully awakened to the possibilities of this health age. There is little excuse. Information and practical knowledge are not lacking; in fact, those who would gladly guard the public's health have more knowledge for that purpose than



A COMPARISON OF CHICAGO'S APPROPRIATIONS FOR HEALTH. POLICE AND FIRE.
Note that "Health" receives a smaller allowance each succeeding year.

A SUGGESTION. WHICH IF FOLLOWED, WOULD LOWER THE DEATH RATE IN THE CITIES

they know what to do with,—oftentimes they cannot even give it away! "What a pity it is," said a prominent sanitarian recently, "that some man could not have patented the fresh-air treatment for tuberculosis! He would have been a millionaire many times over, and his treatment would have been, without any doubt, far more popular than Peruna!"

It is to be hoped that the passion for drugging and doctoring the individual will soon be a thing of the past, while the health and well-being of the species as a whole will be given more attention. The problem of disease in relation to cities merely requires the earnest consideration of those gifted with honorable political sagacity; the exponents of medical science are doing their part as best they can. It is now up to the citizen to arouse himself and awaken others to activity, for henceforth it will be to the lasting disgrace of any city if it does not bend every effort to the wholesale eradication of disease by preventive measures accessible to all. Our cities have had the finger of scorn pointed at them often enough; they have it in them to become models for the civilized world—models that may even be regarded with approval by a more enlightened civilization a number of generations hence.

Wisdom of the Ancients

¶ Love thyself, and many will hate thee.

¶ A prosperous fool is a grievous burden.

¶ The truth is always the strongest argument.

¶ Better be ignorant of a matter than half know it.

SUN-POWER TO IRRIGATE THE NILE VALLEY

By

ARTHUR ST. GEORGE JOYCE

THE sandy and sun-baked wastes of the Nile, the arid lands of the Texas Panhandle, the nitrate fields of Chile, the deserts of Africa, in short, those dried out portions of the earth which for centuries have resisted the efforts of the farmer are to be reclaimed by the very thing that has made them desolate—the sun.

There was shipped recently from Philadelphia to Egypt the first section of the first sun-power plant ever invented and put to practical use. This is not the experiment of a dreamer but the completed and tested work—after many months of practical use in Tacony, a suburb of Philadelphia—of Frank Shuman, of Tacony. Nor is this wonderful plant being sent to Egypt hap-hazard; it is going to fill an order of the Egyptian government, an order given after a board of expert commissioners had spent months at the Tacony plant as special investigators for the Khedive. It is backed only after the most exhaustive investigation of the practical use of the sun-power plant.

WATER HEATED BY THE SUN-COLLECTING GLASS FRAMES —AT THE LEFT.—DRIVES THE ENGINE—AT THE RIGHT.

FRANK SHUMAN, WHO HAS RECEIVED AN ORDER FROM THE EGYPTIAN GOVERNMENT TO INSTALL ONE OF HIS SUN-POWER PLANTS.

The Egyptian order was the first but not the only one which has been placed in the past several months. With the assurance from the Khedive's commissioners and from the English financiers, orders

have begun to pour in from every section of the globe until Mr. Shuman has found it necessary to begin the erection of a plant to make sun-power plants. The work on this plant is starting now in Philadelphia.

This, in brief, is the story of the ultimate success of years of effort, of work and of testing, but it gives only a slight idea of the great factor that has entered agricultural and manufacturing development and what this wonderful sun-ray-harnessing machinery will do.

The main object of the sun-power plant is to produce practical power at the least possible cost. The idea of "harnessing the sun" has been the dream of inventors and the desire of the commercial giants for years. Some efforts have met with a certain amount of success but not with practical success. Toys, almost, have been invented which, were they used for commercial purposes, would prove far too costly to be practicable. It was toward the commercial use of the sun-power plant that Mr. Shuman bent all his efforts.

To achieve his end meant high efficiency at a low cost of installation and operation and with a length of service which would not make deterioration a factor. It meant a plant so devised that it would not be unduly affected by wind and weather and so divided that if one section broke down it might be repaired without affecting the operation of the other sections. The inventor bent his efforts to produce a plant that would originally cost no more than about twice as much as a steam boiler of the same horse-power. The 10,000 horse-power plant now being shipped to Egypt meets this every requirement.

The plant which has been in operation near Tacony is built low, so low that the winds have never injured it since it has been in operation. It is expected to operate about eight hours a day in the Nile country and in this latitude it has already turned out 3,000 gallons of water a minute, throwing it to a height of 33 feet. In Egypt, it is expected to treble, possibly quadruple, this capacity.

Mr. Shuman commenced his experiments about ten years ago. The first experiments showed that if the sun's rays beat directly upon a glass vessel and if all losses by conduction, convection and radiation were prevented, the temperature within the vessel would rise to 1,000 degrees Fahrenheit. The heat losses were prevented by a theoretically perfect system of insulation, but this, of course, was impossible for commercial purposes, because of the immense cost. It was found, however, that by the use of well-known and cheap forms of heat insulation sufficient loss could be prevented to produce practical power at almost no cost.

The production of steam by atmospheric pressure keeps the temperature down to 212 degrees Fahrenheit. If there were no steam produced, the heat would rise to 395 Fahrenheit in latitude 40 north and possibly to 400 degrees Fahrenheit near the equator. Whatever excess steam is produced can be, of course, utilized.

With these matters determined, Mr. Shuman commenced his practical experiments. He built three generators. The

THE SUN-POWER PLANT IN ACTION.
It is pumping three thousand gallons of water a minute to a height of thirty-three feet. The practicability of the invention is therefore apparent.

THE SUN-HEAT ABSORBER COMPLETE.

first was merely a wooden box covered with two layers of glass with a small air space between the layers. In the box was a miniature ether boiler. This generator was exposed to the sun's rays, the ether distilled and the amount of heat which might be absorbed determined. Purely as an experiment a small engine was run by this generator. The second generator consisted of a two-inch steam pipe sixteen feet long, insulated at the bottom and enclosed in a box covered by a double layer of glass. In this, also, the ether was distilled and the number of heat units absorbed was determined. The third generator was made of a bed of water pipes, insulated against heat loss, the unit being eighteen by sixty feet, and the motor being an ether engine. This apparatus yielded three and one-half horse-power. From these experiments, which are cited merely to show the foundation of the present perfect machine, the knowledge for the practical sun-power plant was gained.

The 10,000 power plant which goes to Egypt consists of an absorber, a low-pressure engine, a condenser and auxiliaries. It is divided into a number of separate units.

The absorber, roughly speaking, is divided into a series of units, each containing a flat, metal, honey-comb water vessel, rectangular in shape, looking much like a huge wafer with holes in it. A wooden box, with two layers of glass having a one-inch air space between them for a covering, is the setting for the water vessel. Under the surface of this box comes the insulation which prevents heat loss. This is made of a two-inch layer of regranulated cork and two layers of water-proof cardboard.

These boxes are elevated some thirty inches from the ground and rest on supports. This permits them to be shifted so as to rest perpendicular to the sun at the meridian. Such adjustments need not be frequent, in fact not more than once every two or three weeks.

In an effort to concentrate every particle of sun ray possible, plane mirrors of cheap manufacture are so mounted on two sides of the boxes that they reflect upon the surface of the water vessel. This water vessel, itself is connected to a feed pipe at one end and a steam pipe at the other. The steam pipes from the various units of the plant are joined discharging into an eight-inch main which carries the steam to the engine.

The other factors of the sun-power plant are of ordinary construction. The engine is a new type, low pressure, reciprocating steam engine of great steam economy. With it is a condenser and auxiliaries such as are in use in any condensing plant. There is a continuous closed circuit, the water in the condenser being pumped back into the absorber.

The first plant supplies the power for an ordinary steam pump and whenever the sun shines this power has pumped steadily and effectively. It has held up steadily, under all tests, to the capacity of 3,000 gallons a minute, lifted to a height of 33 feet.

Such is the sun-power plant, itself. Its commercial possibilities are limitless and even its manufacturing future is a matter bounded by the imagination alone.

Only during the overflow of the Nile does Egypt have sufficient water to develop her wonderful agricultural resources. Irrigation is done by laborers, thousands of them being used in the territory. The commissioner of the Khedive believes that this one sun-power plant will take the place of over 2,500 laborers and will give what Egypt has never yet

FRONT VIEW OF THE ENGINE, AUXILIARIES AND WATER PUMP THAT FIND A MOTIVE POWER FROM THE SUN'S HEAT.

had—water at all times and in regulated and necessary quantities.

And the cost will be inconsequential compared to the cost of obtaining water in arid countries. This is the great point, the real factor on which the sun-power plant may expect to build its success. Cost of water, the hardship of getting water even at any cost, has been the keynote of the stories of disaster and trial which have so often filled the history of the development and abandonment of certain sections of the Far West. Private companies and governments have spent hundreds of thousands, aggregating many millions in development plans, constructed great dams, turned the courses of rivers and ended, even then, oftentimes in failure.

But the sun-power plant brings water power right at hand even in the most arid districts. The terrors of Death Valley would yield to irrigation. But the cost of irrigation has been too great. There was no way to force the water into the sand wastes and bad lands. Here the sun-power plant will have its use.

Texas, the state where irrigation has made the fortunes of thousands, where crops may be grown the year round if there is water enough, will use the sun-power plant. For there are sections of Texas where irrigation cost is too great to permit the use of irrigation now.

In Africa, in South America, in Mexico, it is the same cry of water, water. But the cost has been too great. The sun-power plant is expected to solve this difficulty also.

These are no dreams or the making of dreams but proven facts, established by the orders that have come in for sun-power plants. The orders have come because the sun-power plant has done its work and has done it well. But in Philadelphia, the plant has been tested under adverse conditions. It is looked upon to do much more in a climate where the temperature is 100 degrees Fahrenheit, as it is in the tropics.

From the absorber of 26 banks of units, each containing 22 single units and having a light absorptive area of 10,296 square feet and an actual area of 5,148 square feet, there has been developed at Tacony during eight hours running of the plant, 4,825 pounds of steam. This was in a temperature of slightly more than one-half of that in those hotter countries in which the sun-power plant is expected to do its best work.

"It will be of interest to know," said Mr. Shuman, in discussing the cost of his plant and its commercial possibilities, "what the comparative cost of sun power and coal power is, in the tropics, as far as our present knowledge and present developments go.

"The sun-power plant must, of course, be a condensing plant, as steam above atmospheric pressure cannot practically be used. I have assumed in estimating, that the 100 horse-power sun plants to be sent to Egypt and ordered for shipment elsewhere, are to be complete in every detail, covering also the pumps necessary for using the power generated for irrigating purposes. In order to put the coal plant on the same basis, I have assumed a simple form of modern compound condensing engine, with good economy for such small powers, viz.: 3 pounds of coal per brake horse-power. This coal plant is also to be fully equipped with all condensing apparatus and pump for utilizing the power for irrigating purposes. They are both to be based on running eight hours per day, to be

manufactured in Philadelphia, in portable shape, and erected at some fairly accessible point in the tropics.

"The comparison would then stand as follows:

COST OF OPERATING 100 HORSE-POWER SUN PLANT FOR ONE YEAR.

Original cost of plant	$20,000.00
Interest on $20,000 at 5%	1,000.00
Wear and tear at 5% per annum	1,000.00
One engineer, 350 days at $5.00	1,750.00
Total	$23,750.00

COST OF OPERATING 100 HORSE-POWER COAL PLANT FOR ONE YEAR.

Original cost of plant	$10,000.00
Interest at 5%	500.00
Wear and tear at 5% per annum	500.00
One engineer, 350 days at $5.00	1,750.00
Total	$12,750.00

"The above comparison shows it would cost $1,000 per year more to operate a sun plant than a coal plant, and do the same amount of work. All minor expenses, such as lubrication, etc., are the same in both plants.

"The 100 horse-power coal plant, based on a coal consumption of 3 pounds per brake horse-power hour, would burn during the year 375 long tons of coal. This, when divided into the $1,000 which the sun-power plant costs above the coal plant, would bring the cost of this coal to $2.66 per ton; showing that wherever coal can be obtained at a cost of $2.66 per ton, both the sun plant and the coal plant would be equal competitors.

The great savings which would occur through the use of the sun-power plants, consist in the fact that through vast regions of the tropics coal varies from $5.00 per ton at the most accessible seaports to as high as $30.00 at inaccessible points. At the general average it might as well be assumed that coal throughout great areas of the tropics will average $15.00 per ton; and here lies the great field for sun power.

"Coal in the Chilean nitrate districts for instance, I have been officially informed, costs $14.60 per ton, and there is room for 100,000 horse-power in this region alone."

An idea of the confidence which Mr. Shuman has in the possibilities of his sun-power plants is made clear in this statement:

"The further development of solar power has no limit. Where great natural water powers exist, sun power cannot compete; but sun-power generators will, in the near future, displace all other forms of mechanical power over at least 10 per cent of the earth's land surface; and in the far distant future, natural fuels having been exhausted, it will remain as the only means of securing heat for the human race."

HITTING BELOW THE BELT

By

ROBERT G. SKERRETT.

COMMANDER Cleland Davis, U. S. Navy, has invented a revolutionary torpedo, which profits by all that has been done in the art of war toward increasing the speed and the range and the precision of attack of this instrument of destruction. It does away with the explosive charge of guncotton which has so long been the torpedo's means of working havoc when once it had reached its mark. In place of the guncotton warhead, Commander Davis substitutes a gun capable of firing an explosive shell—the projectile being designed to burst after it has pierced the hull plating of the enemy's vessel, and, found its way to the ship's vitals, such as her engines, boilers, magazines or shell rooms. Cunning construction of battleships has substantially neutralized the powers of the ordinary torpedo, notwithstanding the fact that the deadly load in the warhead has been largely increased; but the Davis gun torpedo has again brought about a crisis, and the mightiest of modern dreadnaughts have now a new menace to face. The blow of a fist over the heart or upon the head may render the victim unconscious, but a dagger thrust or a bullet in either one of these is pretty nearly certain to mean death. Popularly expressed, in round terms this is the essential difference between the ordinary automobile torpedo and the weapon which Commander Davis has brought into being.

PHOTOGRAPH TAKEN JUST AS A SHELL HIT ITS TARGET.

The new torpedo carries within its head a gun capable of discharging a projectile of eight-inch caliber, which can be loaded with a high explosive, and which can be impelled with sufficient velocity to carry it through several inches of steel. It actually amounts to reducing the battle range of the usual service eight-inch rifle and in placing the gun, therefore, right against the least protected approach to the seat of life of an enemy's ship. Now it takes ordinarily a gun of pretty heavy weight and thickness of walls to provide the muzzle energy with which to carry out Commander Davis' idea—in fact, a larger and more ponderous weapon than could be borne within the limits of the usual service torpedo, big as they have grown to be. However, here is where the metallurgist unconsciously paved the way for the new torpedo. The gun in the Davis weapon is made of vanadium steel, and this composition furnishes all of the needful strength in combination with remarkable lightness: in

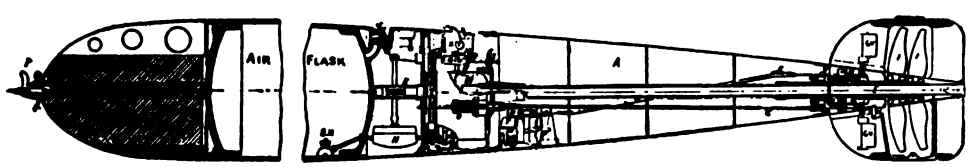


DIAGRAM OF THE REGULAR WHITEHEAD TORPEDO, SHOWING THE GUN-COTTON CHARGE IN ITS HEAD.

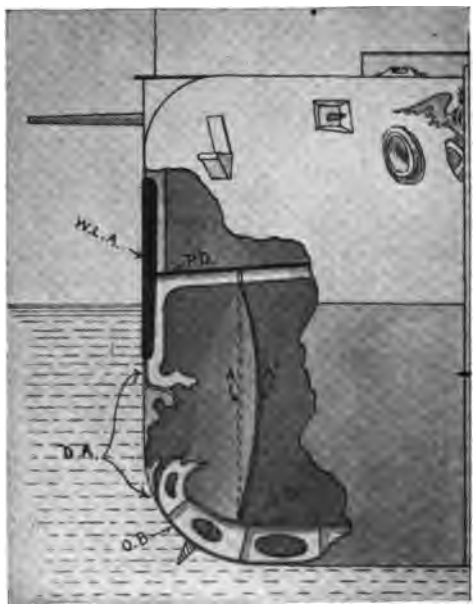
The new torpedo, the Davis, does not use this gun-cotton head. The Whitehead torpedo is not necessarily fatal to the vessel against whose side it explodes.

MODEL OF BATTLESHIP WITH NETTING DRAWN AROUND IT, SHOWING METHOD OF PROTECTION AGAINST TORPEDOES.

brief, makes the gun-torpedo practicable. In an ordinary gun, vanadium steel would not do because it would soon be damaged by the intense heat of the powder gases—that being one of the penalties of using this alloy; but a torpedo in time of war is expected to operate only once, so the life limit of this new steel does not concern Commander Davis, provided the gun can do its work well when it makes its single attack.

In foreign navies, it is the wellnigh universal practice to further safeguard their ships from torpedoes by lowering defense nets. These nets are held off from the sides of the ships by means of booms, their meshes are fashioned of tough metallic links, and they are generally sufficient to halt the torpedo in its flight and to cause it to explode at arm's length, so to speak, where it can do but little if any damage. Now the same netting would also cause the Davis torpedo to function, i. e., the gun would be fired and the explosive shell expelled, but the subsequent effects would be quite different from those of its usual rivals. The projectile would easily pass through the torpedo netting, traverse the intervening water, and strike the bottom plating with sufficient remaining velocity to carry it through the opposing steel and into the craft's vital interior, where it could burst into many pieces and spread havoc. In order that the shell may do this, it carries what is known as a delayed-action fuse, which withholds the ignition of the bursting charge until a definite interval of time has passed. To a layman a fiftieth or a hundredth of a second is meaningless, but to the ordnance engineer it is an appreciable period.

It was only a few years ago when the maximum effective range of the torpedo was something like 1,800 yards—the attacking craft had to get that close to her objective—possibly in the face of searchlights and the withering blast from a battery of quick-firing guns. Today, thanks to improvements in the motive power and the superheating of the compressed air impulse, torpedoes have accredited ranges all the way from 4,000 to 7,000 yards—rumor being responsible for a possible range of even 10,000 yards in the latest of European torpedoes. Now

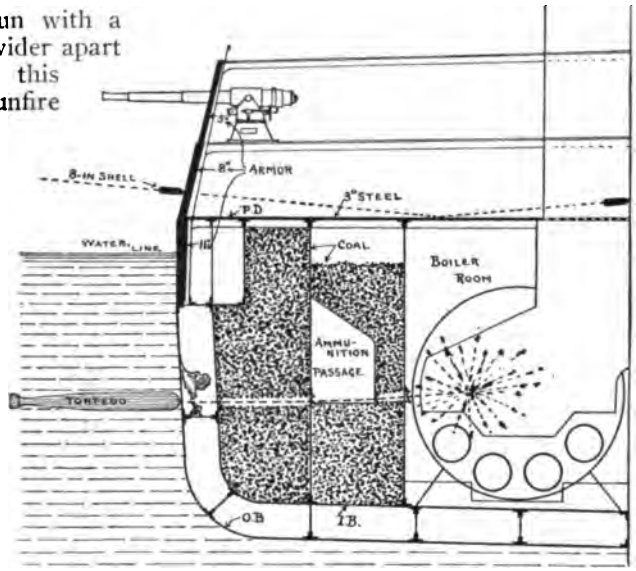


CROSS SECTION OF A RUSSIAN BATTLESHIP INJURED IN THE WAR WITH JAPAN BY THE EXPLOSION OF A SUBMARINE MINE. BUT NOT FATALLY DAMAGED.

D. A. shows the damaged area where the outer and the inner bottom platings were shattered. A. marks the position of a protective bulkhead, and A^1, the same bulkhead bent inward but not ruptured by the same force of the explosive gases.

the further a torpedo can run with a fair likelihood of success the wider apart ships must remain to avoid this menace—relying then upon gunfire to damage the foe.

An eight-inch armor-piercing shell at 2,000 yards would be able to perforate a battleship's casemate armor eight inches thick, but would not have enough velocity left to pierce the protective deck lying over the vitals. Two thousand yards is an improbably short battle range. Most of the next great sea fights will be settled virtually before the opponents get closer than 5,000 yards. On the other hand, the gun-torpedo can reach its mark where the eight-inch rifle would be useless, and, once in touch with its target, could do untold damage. Instead of firing at the enemy at a distance, it is like placing a pistol against his temple before pulling the trigger.



CROSS SECTION OF A MODERN BATTLESHIP, SHOWING HOW A DAVIS TORPEDO WOULD INJURE THE OUTER BOTTOM AND THEN SEND ITS EXPLOSIVE SHELL THROUGH THE COAL BUNKERS AND INTO A BOILER ROOM OR OTHER VITAL PART OF THE VESSEL.

Recent tests of the Davis gun-torpedo in the lower Chesapeake Bay have amply emphasized the possibilities of this invention. The first time, the torpedo sent its projectile through and through the target, the target representing the cross-section of a vessel with inner and outer bottom plating and three interposing bulkheads of tough steel. The shell exploded in the water on the far side of the target. The next test consisted in the torpedo assaulting the side of the target which had an outside protection of armor plate. The shell burst when it hit this plate and did not penetrate, but it wrecked the structure so much that the target sank shortly afterwards. Had the fuse been properly timed, the projectile would have passed through the armor and have burst inside the structure. The trials in the Chesapeake were governmental repetitions of private tests which had been carried out successfully some time previously.

The sea-going torpedo boat, or torpedo-boat destroyer as it is commonly called, and the submarine are the vessels designed purposely to use the torpedo as their prime instruments of offense. The destroyer counts upon her speed and the cover of darkness to get her close enough to strike her quarry—in the daytime she would invite, practically, certain destruction if she tried to reach the foe in the face of modern rapid-fire guns. Here is where the submarine comes in. This order of torpedo craft expects to do in broad daylight what the destroyer hopes to do under a cloak of fog or the gloom of night. In either case the Davis gun-torpedo adds immeasurably to their potential powers of doing harm, giving the defense a heavier burden to bear and increasing the tax upon the nerves of the personnel.

This new weapon has robbed the enveloping water of a vast measure of its protective value, has made the submarine gun more dangerous than the biggest cannon now carried aboveboard, and completely upsets the prevailing schemes for under-water defense against the torpedo. Truly this is revolutionary; and well may we ask the question, What is coming next?

AN ARCHITECT'S DESIGN OF THE PROPOSED NEW HOME FOR OUR PRESIDENTS, ON MOUNT FALCON, FIFTEEN MILES FROM DENVER.

NEW SUMMER HOME FOR OUR PRESIDENTS

By

ROBERT H. MOULTON

THE citizens of Colorado have started a campaign to provide for the President of the United States a summer home in that state. The plans, which have already been completed, call for a veritable palace of most original and picturesque design, the like of which does not exist in this country. It will take rank with any of the existing palaces of European monarchs. The idea originated with John Brisben Walker, and a committee of prominent Colorado men is now in charge of the movement.

The proposed home is on Mount Falcon, fifteen miles from Denver, in the front range of the Rockies. It is planned to make the gift a token from the people of Colorado, and contributions are now coming in from all over the state. The fund was started by subscriptions from leading bankers and business men in

IN THE ROUGH RED ROCK COUNTRY, NEAR MOUNT FALCON.

THE PRESENT TRAIL WOULD BE CHANGED TO A GREAT ROAD.

VIEW FROM MOUNT FALCON TO THE NORTHWEST.

Denver. Ground has already been broken and it is hoped the building may be constructed in time for next summer.

President Taft when apprised of the summer home plan, expressed the opinion that no locality could offer finer natural attractions for such a structure.

The proposed house will be unique in many ways and exceedingly attractive. The plans as prepared by Architect James B. Benedict call for a noble and massive structure of gray granite, contrasting with the natural setting for the building. The house will provide ample room for the President's attendants. Automobiles would bring the summer capital within forty minutes of Denver.

The view that the site of the building commands is its strongest feature, and it is this that was strongly urged in making a choice of sites. Among all the wonderful and beautiful scenic spots within a short distance of Denver, Mount Falcon stands preeminent. Its magnificent rocks are softened by lichens. Night and morning on the mountain are like the beginning of creation; it is so different from the rest of the world that it seems as if one were in a fairyland of color. A hundred tiny lakelets of quicksilver come into view as the sun rises over the limitless plains to the east, and at evening these change to turquoise, or rose color, or emerald as the sky may reflect.

From the north terrace of the mountain, upon which the drawing room and library will open, the steep mountain side, wooded with pines, drops down two thousand feet into the rushing waters of Bear Creek; to the south, seventy-five miles away, is Pike's Peak. Denver lies fifteen miles away to the northeast. When a passing cloud covers the city with its shadow, the plains seem barren of houses. Then suddenly the sunlight pierces through, and a great city stands revealed.

The Federated Marketing Clubs

By

FRANCIS B. ATKINSON
Secretary of the Committee on Organization

COMMITTEE ON ORGANIZATION.

Mrs. M. S. Grainger, President Illinois Federation of Women's Clubs; Arthur G. Graham, President Small Park and Play Ground Association, Evanston; Mrs. J. H. Jaffray, Vice President Cook County League of Women's Clubs; Dr. Rachel Hickey Carr, 4810 Lake Ave., Chicago; Mrs. Harriette T. Treadwell, Chairman Social Committee Chicago Equal Suffrage League, formerly President Chicago Teachers' Federation; Francis B. Atkinson, Secretary; John Fitzpatrick, President of Chicago Federation of Labor; Mrs. Harry S. Hyman, Chairman Program Committee Illinois Federation of Women's Clubs; Mrs. George Vosbrink, Vice President for the First District, Illinois Federation of Women's Clubs; Mrs. Freeman Brown, President Cook County League of Women's Clubs; Miss Jennie F. W. Johnson, President South Side Equal Suffrage League; Mrs. M. S. Hartshorn, Chairman Woman's Party of Cook County; Mrs. C. E. Clifton, President Woman's Club of Evanston; E. R. Pritchard, Secretary Chicago Health Commission; Mrs. E. L. Bay, President, Mrs. H. R. Risinger, Recording Secretary, Woodlawn Woman's Club; Mrs. Thomas H. Hall, President Millard Avenue Woman's Club; Rev. A. E. Bartlett, Church of the Redeemer, Chicago; Miss J. Macklin Beattie, President Canal Zone Federation of Women's Clubs, Ancon, Isthmus of Panama; Mrs. S. P. Johnson, President New Mexico Federation; Mrs. Julian Heath, Chairman Committee on Household Economics, City Federation of Women's Clubs and President Housewives' League, New York City; Mrs. L. G. Wheeler, Corresponding Secretary Wisconsin Federation.

MRS. JULIAN HEATH, President of the New York Housewives' League, is one of the new and enthusiastic members of the Federated Marketing Clubs. The league of which Mrs. Heath is the head was formed under the auspices of the Committee on Home Economics of the New York Federation of Marketing Clubs—which has 165,000 members.

The plans of the league are similar to those of the Federated Marketing Clubs, which Mrs. Heath so warmly endorses:

"Your papers have been carefully considered by me and also by our Central Council. All are enthusiastic in regard to your scheme. It is, I believe, a step beyond what we are undertaking and which our work will educate for. I want, now, to catch every buyer and make her realize her power and responsibility. I can help you here in the East and shall be glad to do so."

Since the relation of the Federated Clubs plan to the dealer is one of its most practical features, it is with satisfaction that this communication from the President of one of the State Federations of Women's Clubs is given:

"My husband is in the mercantile business and the proposed methods of distribution through local houses is of considerable personal interest to us. I shall be glad to assist in the establishment of such an organization and believe that it will be highly beneficial. If I can serve you on committee or otherwise, please command me."

Similar expressions of approval have been received from both wholesale and retail grocers and food manufacturers. The President of one of the trans-continental railroads, says:—

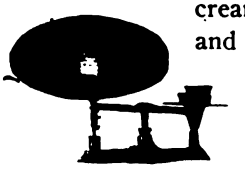
"Your plan is not only based on sound business principles, but it seems to me to be a great humanitarian movement. We believe that one of the most important functions of our own work is to teach the farmer how to make more profit by being a better business man. As I understand it, your plan proposes to accomplish the same object for the business of the household and I am sure that the farmers, as well as the railroads, will be with you."

MRS. JULIAN HEATH.

THE LUMP OF PUTTY BENEATH THE PAN HELPS TILT THE SCALE.

WAYS OF CHEATING AND THE PENALTY.

IT is difficult for a man to be an inspector without looking the part. The result is that as soon as an inspector of weights and measures appears—which is not often as there are few inspectors in proportion to the ground to be covered—most of the various instruments of deception can be readily removed until he goes away. Moreover, few cities have any weight and measure inspectors.



BEWARE OF THE WIRE NAILS IN THE BOTTOM OF THE SCOOP.

Even without such inspection, probably not one grocer in a thousand would cheat in his weights and measures if consumers, in any organized and systematic way, would protect the honest man against the competition of the dishonest. Under present conditions, one dishonest grocer in a neighborhood almost compels all the other grocers to practice similar dishonesty and to offer fictitious bargains based on these short weights and measures.

Wherever there is a sufficiently large group of buyers in a given district in any city or community to warrant the establishment of a local office, Marketing Club members will, in addition to reduction in prices and insurance of quality, be insured honest weights and measures in dealing with all grocers distributing for members. Scales and measures will be subject to inspection by inspectors employed by the Marketing Clubs. As an additional check on dishonesty, all reports of short weights made to a local office will be immediately disseminated to all club members dealing with grocers in that district.

WILL THE FARMER STAND BY US?

The Secretary of a Chicago Labor Union writes: "When the Chicago Labor Unions ran a co-operative store, the commission men overbid them with the farmers and cut off their sources of supply. What are you going to do about that?"

To protect both the farmer and the consumer, it is necessary to enter into a written contract. This is the way the Middleman deals with the farmers, the creameries and other food producers and he is perfectly right in doing so. When it comes to standing by one another, isn't the consumer as much to blame as the producer; being always ready to desert a man who has reduced prices, for some large competitor who temporarily reduces them still more?

DETECTION OF BUTTER SUBSTITUTES.

Place a sample of butter, two or three times the size of a pea, on a large spoon over an ordinary gas lamp or burner. Good fresh butter will boil quickly and quietly, producing a num-

REDUCING WEIGHTS BY BORING HOLES IN THEM.

BUTTER IS WEIGHED IN A WATER-LOGGED WOODEN PLATE.

ber of small foamy bubbles. Imitation butter will crackle and sputter, making a noise very similar to that caused by the placing of a green stick on a hot fire.

FOODS TESTED AT WESTFIELD.

In this department, in the February issue, was published a list of foods tested and found pure by Professor Allyn and his pupils at the State Normal School, Westfield, Mass. Following is a list of additional foods which were found free from adulterants:

PURE BUTTER BOILS QUICKLY. OLEOMARGARINE SPUTTERS.

Salads and Condiments for Salads: Downing Taylor Co., Springfield, Mass.: Forest Park Shrimp. A. Colburn Co. Philadelphia, Pa.: cayenne, black pepper, white pepper, cinnamon, clove, ginger, mace, mustard, nutmeg. Louis DeGroff & Son, New York City: (Health Brand) black pepper, cinnamon, cloves, mustard, ginger. B. Fisher & Co., New York City: black pepper. Francis H. Leggett, New York City: (Premier Brand) black pepper, white pepper, ginger, mace, pickling spice, allspice, cinnamon. Seaman Brothers, New York City: La Rose Blanche Olive Oil. Nice, France, Beri Olive Oil. W. A. Castle, Springfield, Mass.: Castle's Olive Oil. California Olive Growers' Association: Sylmar Olive Oil. Heinz Preserving Co., Pittsburg, Pa.: Heinz Olive Oil. Francis H. Leggett, New York City: Premier Olive Oil. Beechnut Packing Co., Canajoharie, New York: Beechnut Vinegar. Nicelle Packing Co., New York City: Nicelle Olive Oil. Heinz Preserving Co., Pittsburg, Pa.: Cider Vinegar, Malt Vinegar, Pickling Vinegar.

Flour: W. F. Fletcher, Southwick, Mass.: graham flour, rye flour, buckwheat flour. Johnson Educator Food Co., Boston, Mass.: Dr. Johnson's Educator Flour. Washburn-Crosby Co., Minneapolis, Minn.: Gold Medal Flour. Hecker-Jones-Jewell Milling Co., New York City: Hecker's Flour.

Baking Powders: Royal Baking Powder Co., New York City. Price Baking Powder Co., New York City and Chicago: Cream Baking Powder. Cleveland Baking Powder Co., New York City: Cleveland Superior Baking Powder. Rumford Chemical Works, Providence, R. I.: Rumford Baking Powder.

Collier's
THE NATIONAL WEEKLY

A recent issue of Collier's Weekly which itself has performed such important service in the campaign for pure food says:

Lowering the cost of living and also improving the quality of living is the object of a plan started in Illinois along lines that are certainly of interest. The Federated Marketing Clubs, an organization now in the preliminary stages, has made an investigation covering a period of about six months, and has reached the conclusion that the quality of food generally sold is worse than is known, and that prices are from fifty to one hundred per cent, at times even five hundred per cent, higher than they would be if distribution were properly organized. It does not blame the middlemen, who also suffer from our present system and desire a change.

The organization intends to look into the quality of foods made by various manufacturers and dealers, and to invite bids. It wishes not only to determine the quality of food, and to aid in establishing reasonable prices, but to increase the legitimate profits of producers and distributors and to co-operate with growers in providing markets for country produce which now goes to waste.

Distribution is possibly the biggest problem of our day, and something along the lines of this Illinois idea will ultimately come to pass.

PROTESTS IN BEHALF OF THE CANNERS.

Frank H. Gorrell, Secretary-Treasurer and Director of Publicity of the National Canners' Association quotes the following from my address before the Cook County League of Women's Clubs in which the Marketing Club Plan was first made public:

"When you buy canned foods you have no idea what you get. It may be pure but it may also be filled with enough poison to cause illness and even death."

Nothing of the kind was said but I am glad of the opportunity of giving space to Mr. Gorrell's account of the purposes and attitude of his Association on the canned food question. He states

that his organization stands for the abolishment of chemical preservatives and was one of the first to file a protest with President Taft against the removal of Dr. Wiley.

That so many important canners out of the 2,000 and odd in this country have been organized for the purpose of co-operating with public officials in insuring pure canned goods is a very hopeful sign of the times, but that there is nevertheless need of an organization of consumers to protect themselves; that without such an organization, no public inspection or combination of manufacturers can ever effect this purpose, is shown by the next remark in Mr. Gorrell's letter:

"Working on these lines (in support of Dr. Wiley) we have incurred the enmity of all manufacturers of chemical preservatives."

That there are not only manufacturers of chemical preservatives but canners who use them there is ample evidence not only in the repeated judgments against manufacturers of canned goods for the use of such preservatives but still stronger testimony as the result of private investigations. These have not encountered the difficulties of public inspection which are always inevitable and with which we are all so familiar.

AN UNSAFE PACKAGE. Blown out at the top by the accumulation of gases within the can.

Never buy canned goods that have bulged out at either top or bottom (as shown in the illustration). These goods have either been improperly canned or contain foreign elements; and decay has begun to generate gas.

CO-OPERATIVE MOVEMENTS.

The Pennsylvania Grange Enterprise

One of the most ambitious undertakings in the co-operative line is that of the Pennsylvania State Grange which is attempting to bring into one organization, the producer, the city consumer and the retail grocer. Druggists and other retail merchants as well as grocers are eligible to membership in the organization. Each group is required to pay to the Association a percentage of its gross receipts varying from 6% for grocers to 15% for druggists. The fund is divided into six parts, four of which are put aside for distribution among consumers, one to be spent for advertising and one for administration and operating expenses. Profits are to be divided among consumers according to purchases, after the plan of the English Wholesale Societies. Work is at present being done among New York City consumers and a large number of members are said to have been enrolled.

Success of a Small Marketing Club.

Mrs. Bleecker Bangs, of 400 Lafayette Ave., Brooklyn, has formed, with a half dozen of her neighbors, a marketing club for which she does the purchasing and saves from 33⅓ to 50 per cent. At present the club handles only staple articles like butter, eggs, rice, jams, canned and bottled goods and produce. Later, tea, coffee, ham and bacon are to be added. In a club conducted on this plan it is necessary that the members live close to each other. Every Friday evening, the members of the club meet and leave their lists with Mrs. Bangs. She goes to the wholesale grocery and produce district about 8 o'clock in the morning, because the groceries have by that time supplied their wants and she can pick up genuine bargains for the members of the club.

PLAN AND PURPOSE OF THE FEDERATED MARKETING CLUBS.

The Plan provides for the formation of local clubs and their affiliation, under the name of The Federated Marketing Clubs, through a general organization similar in character to the General Federation of Women's Clubs.

The Purpose is to reduce prices by collective buying through purchasing agents, warehousing, etc.; to insure purity and honest weight by a system of inspection under direct control of the Clubs; to provide a market for home food industries of the farm

and city; and to furnish a means of communication between farmers and other producers who wish to quote prices to groups of city consumers.

Membership involves no expense. There is no membership fee and the annual dues of $1.60, which are to be devoted to the expenses of promotion and publicity, are to be deducted from dividends on purchases provided for under a system similar to the dividend plan of the Wholesale Societies of England.

Even a single member in any city or community, where a local club has not yet been formed, can have goods, inspected under the Marketing Club System, delivered through a local grocer.

Distribution is to be made under contract through retail grocers. Grocers can also purchase of the Marketing Clubs on their own account.

Marketing Club Literature: Marketing Club literature will be mailed on request addressed to the Secretary of the Committee on Organization, 4937 Vincennes Ave., Chicago. Send also the names of friends who would be interested.

Proverbs

¶ Cleanliness is a fine life-preserver.

¶ Among the blind the one-eyed is king.

¶ A man cannot tell for whom he is hoarding.

¶ According to your purse govern your mouth.

¶ A handful of good life is better than a bushel of learning.

¶ Crows are never the whiter for washing themselves.

¶ A morning sun, and a wine-bred child, and a Latin-bred woman seldom end well.

COOKING IN PAPER BAGS

IT took Nicolas Soyer, late chef of the Brook's Club, London, whose name has now become an international household word in connection with his paper bag system of cooking, fifteen years to make the art so simple that it could easily be learned even by mere beginners in the art of cooking.

Professional culinary artists know that, in cooking, it has long been the custom to wrap small articles, such as fish, in paper. This is called, treating them *en papillottes*. One day, when, as chef to the Dowager Duchess of Newcastle, M. Soyer had covered a piece of fish with foolscap and told the kitchen maid to add the sauce, she put in too much. Presently the paper vessel began to bubble and then—

Pouf!

The paper vessel had exploded.

At first, this gave M Soyer a shock. Then it gave him an idea; for upon examining the fish he found it beautifully tender, but tasting somewhat of the paper.

"I wonder whether I could cook by steam," said M. Soyer talking to himself.

With the swift action of an artist, this was no sooner thought than tried; some meat, some vegetables and a little water were placed in an envelope on an iron shelf in the oven. Again an explosion, again the burning of paper, again the food deliciously cooked and tender, but still tasting of the paper as it had done before. It seemed that the difficulties were unsurmountable—that the taste of the paper would always remain.

Then for three years M. Soyer stopped putting things in paper bags, but he put the idea away in his head, where it simmered. Meanwhile he had entered into the employment of Sir Herbert Naylor-Leyland. It occurred to him, one day, that he would try again. This time it was chicken with rice. At the proper time, out of the oven it came with a lovely golden tint and flesh as tender

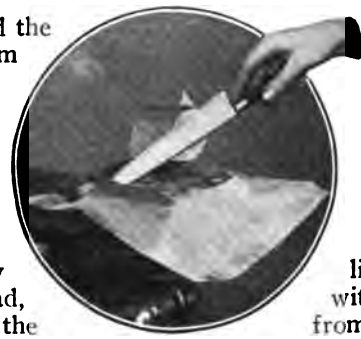
LIFT THE UPPER EDGE OF THE BAG, AND INSERT THE FOOD.

IN PUTTING THE BAG IN THE OVEN, NEVER SET IT ON A SOLID SHELF.

Place it on the wire rack shelf, or on a wire broiler. The contents will thus cook uniformly, and the danger of the bag's bursting will be greatly minimized. This is the only approved method of cooking in the oven.

as you could imagine—but still the taste of paper. Again a temporary abandonment of the idea until many years later when M. Soyer saw in a London newspaper that Herr Lampert, a Frankfort chef, was in London with a special oven for paper bag cookery; and the newspaper told what wonderful things Herr Lampert had done.

"This will never do" said the Frenchman, his patriotism and pride at once aflame. So he promptly sent a "challenge" to his German rival—weapons, paper bags. The three judges before whom the "duel" was fought at the National School of Cookery in Buckingham Palace Road, gave the decision to the Frenchman. He cooked eleven dishes and every one was done to a turn; but there was one judge who was not satisfied—M. Soyer himself, for there was still a flavor of paper in the food. The thing to do was to find a kind of paper that would stay on its side of the fence—so to speak; so M. Soyer worked on the idea all day in the kitchen at the Brook's Club, as circumstances offered, and took the idea to bed with him when he went home. It was a troublesome bed-fellow, as the ideas of geniuses are apt to be.



REMOVING THE FOOD FROM THE BAG AFTER COOKING.

"I could not rest in my bed" says M. Soyer in his little book of directions for the housewife, "and I often had to get up at two o'clock in the morning in order that I might put my paper bag to some fresh test."

Persistence and years of experience in cooking finally solved the puzzle. A paper bag was produced that any housewife can use successfully; and as a result the subject of paper bag cookery is attracting attention almost as great as that of the cost of living and the wholesomeness of food, to which it is so closely related. Here are, in brief, the merits of paper bag cookery:

Dish washing is reduced to a minimum—with paper bags there are no pots or pans to clean.

Expert cooking with reference to a long list of foods which has hitherto been the luxury of the rich is now equally the privilege of the poor and within the skill of any ordinary cook.

No special kind of stove or oven is required. All that is needed in addition to the ordinary oven is a broiler and the paper bag. The use of the broiler is explained in M. Soyer's book.

The advantages of paper bag cooking over the ordinary boiling and baking processes are that it prevents food from shrinking and from losing its natural flavor—an important result, whether one is considering the pocketbook or the palate.

Many women who would like to cook and experiment with new dishes are kept from doing so by the dislike of the smell of cooking or the headaches caused by the heat of the range, the dislike of handling greasy pots and pans, and so on. Others cannot spare the time from their usual cooking and other household duties. With the paper bag system all of these obstacles are removed.

The system especially commends itself to those who have kitchens in small flats where there is little space for pots and pans. It is also just the thing for women living in single rooms, such as teachers, stenographers and clerks. With the paper bag system they can cook, for themselves, a simple and satisfactory meal in half an hour and have nothing to wash but a plate and other necessary table utensils.

The paper bag is the foe of the microbe. The microbe has no resting place. After each meal, the bags in which cooking has been done, are thrown into the fire and fresh, clean bags are used for the next meal.

M. Soyer's book which, like the paper bags, should be a part of the equipment of every kitchen, is a perfect cyclopedia of recipes and directions for cooking under this system. M. Soyer's experience is too wide and his reputation too great to make extravagant claims. On this point he says (Soyer's Paper Cookery, page 19):

"I do not claim for the paper bag system that it can cook everything. It is

evident that tea must still be made in the teapot. Generally speaking, we may waive our claim to have mastered the difficulty with respect to soups, although I have made beef tea with excellent results."

Then follows a short list of eleven articles, including an omelette, which are not adapted to the paper bag system.

Only five directions are given as to the method of handling the bags, but these are important although very simple when once you know how. For example, says M. Soyer's Book:

"Occasionally a bag may leak in which event, it is not necessary that the food should be emptied and transferred to another bag. Simply put the bag within another."

Simple and easily followed, as these directions are, their necessity is apparent, for:

"Some people have failed to obtain the right result and when inquiries have been made, it has been found that food has been placed in a dish and the dish placed in the bag and the bag placed on the broiler!"

An important detail to be considered is the distance the bag should be from the oven floor or solid shelf in the case of a gas stove. This also is fully explained. Each article has its special shelf in the oven: roasts and entrees on one, fish on another, pastry on another, and so on. If one does not follow these directions, results cannot be obtained, but the directions are exceedingly simple.

A nice question arises as to what to do when the heat declines, as it sometimes does in any oven, and the housewife would like to know how the food is getting on. How can she find this out with regard to food hidden in an opaque paper bag; and isn't there danger of overcooking? I will not spoil the reader's interest in the story by giving the answer.

Another curious and important fact about paper bag cooking is that it is not necessary to open the oven door every now and then to "See how the roast is getting on."

HOW THE BAG IS SEALED.
The mouth of the bag is folded two or three times over and should be fastened with a clip.

Not only does M. Soyer's book give full directions for the use of paper bags in connection with all the various lines of cookery to which it applies, but there is a very full list of recipes which have hitherto been the secret of the chef. These recipes cover fish, entrees, poultry, roasts, vegetables, savories, sweets, cold meat cookery, breakfast dishes and invalid dishes. The book also contains articles by G. R. Sims, Dr. Charles Reinhardt, ("Paper Bag Cooking from a Health Point of View") and Mrs. Alfred Prago, who in England is famous not only as a writer on cookery, but as an expert in cooking, whose reputation bears favorable comparison with that of our own Mrs. Rohrer.

Desirable Assignment

"Is YOUR town doing anything in the uplift way?"

"Oh, yes! We have a committee appointed to see all shows suspected of being immoral and report on them."

"Good!"

"Yes, a committee of one thousand."

"Indeed! Isn't that a—er—rather large committee?"

"Well, you see, we couldn't afford to create any hard feeling, and so we made it large enough to include about everybody."—*Lippincott's.*

A Winner

"Boy, take these flowers to Miss Bertie Bohoo, Room 12."

"My, sir, you're the fourth gentleman wot's sent her flowers today."

"What's that? What the deuce? W-who sent the others?"

"Oh, they didn't send any names. They all said, 'She'll know where they come from.'"

"Well, here, take my card, and tell her these are from the same one who sent the other three boxes."—*Tit-Bits.*

An Important Conversation

THE TALL AND AGGRESSIVE ONE—"Excuse me, but I'm in a hurry! You've had that 'phone twenty minutes and not said a word!"

THE SHORT AND MEEK ONE—"Sir I'm talking to my wife!"—*Puck.*

As the Boy Sees It

"Now, Willie," said the superintendent's little boy, addressing the blacksmith's little boy, who had come over for a frolic, "we'll play 'Sabbath School.' You give me a nickel every Sunday for six months, and then at Christmas I'll give you a ten-cent bag of candy."—*Woman's Home Companion.*

Starting Something

"GEORGE," she asked, "if we were both young and single again would you want me to be your wife?"

"Now, my dear," he absent-mindedly replied, "what's the use of trying to start a quarrel just as we have settled down to enjoy a quiet evening?"—*Chicago Record-Herald.*

At the Y. M. C. A.

"WHEN I marry," said the girl, "I am not going to marry a man who drinks, smokes, plays cards, or who belongs to a club. Still, I want him to have a good time."

"Where?" he asked.—*Ladies' Home Journal.*

A New One

"LOOK here, sir, I got up to give my seat to that lady!"

"That's all right, old fellow; she's my wife."

An Old Species

"WHAT is the name of that species I just shot?" inquired the amateur hunter.

"Says his name is Smith, sir," answered the guide, who had been investigating.—*Washington Herald.*

Wisdom

"KICKING is bad policy. Behold the mule. Kicking never gets him anywhere."

"That is exactly why the mule kicks."

"Eh?"

"He doesn't want to get anywhere."—*Birmingham Age-Herald.*

Impossible

RASTUS—"What yo' t'ink is de mattah wif me, doctah?"

DOCTOR—"Oh, nothing but the chicken pox, I guess."

RASTUS (getting nervous)—"I 'clare on mah honah, doctah, I ain't been nowhar I could ketch dat!"—*Medical Times.*

Bona Fide Americanism

A SOMEWHAT unpatriotic little son of Italy, twelve years old, came to his teacher in the public school and asked if he could not have his name changed.

"Why do you wish to change your name?" the teacher asked.

"I want to be an American. I live in America now. I no longer want to be a Dago."

"What American name would you like to have?"

"I have it here," he said, handing the teacher a dirty scrap of paper on which was written—Patrick Dennis McCarty.—*Everybody's.*

So Provoking

CLARA—"While I was playing whist with Mrs. Singleton last evening, she asked me what was the trump at least six times."

MAUDE—"Weren't you provoked?"

CLARA—"I should say so! As if I knew!"—*Puck.*

Above Suspicion

AN aviator descended in a field and said to a rather well-dressed individual: "Here, mind my machine a minute, will you?"

"What?" the well-dressed individual snarled. "Me mind your machine? Why, I'm a United States senator!"

"Well, what of it?" said the aviator. "I'll trust you."

Not Yet

"HAS anything ever been discovered on Venus?" asked the student of astronomy.

"No," replied the old professor, whose mind had slipped a cog and transported him into mythological fields; "not if the pictures of her are authentic."—*Chicago News.*

Correct

MISS SCRIBBLE—"The heroine of my next story is to be one of those modern advanced girls who have ideas of their own and don't want to get married."

THE COLONEL (politely)—"Ah, indeed, I don't think I ever met that type."—*Life.*

Seeing Is Believing

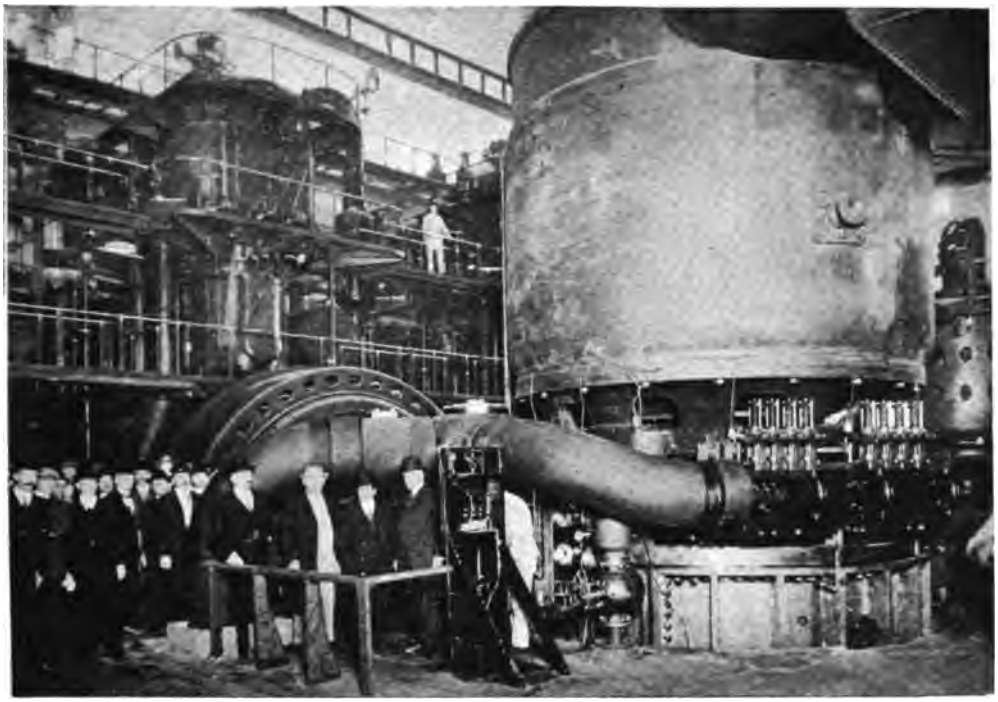
I'M afraid you may think we're giving you a lot of fish this week, old man," said the genial host, as they sat down to dinner. "The fact is, my wife has got hold of what sounds like a really capital device for removing a fish-bone stuck in the throat, and we want to see if it works."—*London Globe.*

POPULAR · SCIENCE & MECHANICS SUPPLEMENT ·

PHOTO UNDERWOOD & UNDERWOOD, N. Y.

THE OPENING OF PEARL HARBOR AND CHANNEL, HONOLULU, TO WARSHIPS BY THE ENTERING OF THE U. S. CRUISER *CALIFORNIA*, FLAGSHIP OF THE PACIFIC FLEET.

On December 14, 1911, after ten years' dredging, Pearl Harbor, one of the greatest strategic points in the world, midway between Occident and Orient, was formally opened by the entering of and departure from the harbor of the *California*, with Rear-Admiral C. Thomas in command, thus realizing the dreams of early navigators, who nearly a century ago recognized the worth of Pearl Harbor as a naval base. There was a general celebration in Honolulu, including a banquet attended by ex-Queen Liliuokalani. This photograph shows the *California* returning the salute from Camp Cowles, and coming to anchor just opposite the dry dock.



GENERATOR IN NEW YORK CITY OF 30,000 HORSEPOWER, SUFFICIENT TO SUPPLY ALL ELECTRICAL CURRENT FOR A CITY OF 250,000 POPULATION.
It has replaced seven vertical engines which were in use up to the time of putting this huge plant in operation.

HUGE POWER GENERATOR

THE city of New York makes boast of possessing the largest power generator of its kind in the world. It has replaced seven vertical engines which were in use up to the time of putting this huge plant in operation.

This great generator has a capacity of 30,000 horsepower, sufficient to supply all the current for cities of about 250,000 population. Alone it would supply the cities of Albany, Syracuse, and Utica. Its power is equal to that of the largest ocean liner, thirty of the largest express locomotives or a line of horses six abreast and ten miles long.

A few years ago the vertical engines were the largest ever put up, and now comes a single machine, compared with which they look like toys.

The several generators now in use in New York have a capacity of 500,000 horsepower. At the present time

THE PASSING OF THE LONDON HORSE BUS.
The last of the London General Omnibus Company's horse buses recently made its farewell run from London Bridge to Mongate St. Electricity has superseded the horses. The driver of this bus is said to be 84 years of age.

NEW YORK'S RECENT IMPORTATION FROM AFRICA.
A clever chimpanzee, "Baldy," equipped as a hod carrier.

there are 1,114 miles of mains, feeders, and cables in the underground system. These generators supply electric power for the entire island of Manhattan, containing about 22 square miles and the Borough of the Bronx, having 40.65 square miles.

ELEPHANT AND YOUNG

IT is not generally known that the elephant very seldom breeds in captivity. In the instances recorded it invariably means that the mother was pregnant before her captivity. The two baby elephants with their mothers shown in

AN ARISTOCRATIC HUMBOLDT MONKEY FROM SOUTH AMERICA IN NEW YORK'S ZOOLOGICAL GARDENS.
He is, quite contrary to the usual run of monkeys, nice in his person and his habits. He lives and feeds apart from the other species housed here.

the accompanying photograph were born on board ship on the way from Rangoon to Hamburg. They are six and eight weeks old respectively. By experiment it was shown that although so young they readily recognized their mothers, always refusing to go to strange elephants, while by scent they could easily track the footsteps of their parents round a park. Hamburg has become one of the world centers for the exhibiting of rare and powerful beasts from Africa and the East.

BABY ELEPHANTS BORN IN CAPTIVITY ON SHIPBOARD.
It is not generally known that elephants only most rarely come into the world in circuses, zoos, or other places of captivity. The little fellows herewith shown are, therefore, objects of considerable interest.

NO END OF AMUSEMENT MAY BE AFFORDED BY RAISING PLANTS IN SAWDUST BY FERTILIZING THE SAWDUST WITH A CHEMICAL SOLUTION.

BEGINNING AN EGGSHELL GARDEN

NUTRIENT chemical solutions are commonly used in all biological laboratories. Probably the most popular one of the kind is that invented by Professor Julius Von Sachs, and supplied in tablet form by the Arcadia laboratory at Sound Beach, Connecticut. By the aid of these nourishing tablets plants may be grown in all sorts of unpromising situations and with few roots, because the plant seems soon to learn that when chemicals are provided it does not need to develop ramifying roots to search through the soil for the chemical constituents that are needed for its growth.

One of the most popular methods of experimenting, especially by children and by nature study teachers, has been the growing of a variety of plants from sawdust in eggshells. Holes about an inch in diameter should be made in a board or a plank, and in them the eggshells should be placed after a tiny opening has been punched in the bottom of each shell. The board should be placed over a pan or some similar receptacle to catch the drainage. Plant the seeds in the moistened sawdust and keep them in a warm place. When the plants begin to grow, wet the sawdust with the solution either from the original supply or from the drippings. Among the plants giving most satisfactory results by this method may be mentioned, perhaps first of all as the choice of the writer, white lupine, sunflower, oats, Indian corn. For a decorative climber the hairy vetch has been found to be very satisfactory.

Six tablets should be moistened, and when soft should be crushed and stirred in a quart of water. With the milky fluid feed the young plants. It may be used until they reach maturity. Plants may be grown by this method directly in the solution or on wire netting suspended over the solution, or in crushed stone, beads, bits

END OF ANTENNA OF A BUTTERFLY, GREATLY MAGNIFIED. Antennae of moths are feather shaped.

THE MENACING AIRSHIP IN THE CONSTRUCTION PIT AT SAN DIEGO, CALIFORNIA.
The photo shows the starboard bow, with propellor and acid tanks in right foreground.

of brick, etc., or in any similar material through which the roots may ramify in darkness.

AIRSHIP MENACES HOMES

BECAUSE of his failure to remove a 250-foot airship from a residential neighborhood in San Diego, Cal., the inventor, C. H. Tolliver, is awaiting trial on the charge of failing to abate a nuisance. Health Officer Meade declared that the vast amount of hydrogen gas in the dirigible was sufficient to blow up all the buildings in the vicinity if ignited. Meanwhile the airship refuses to fly, the danger of deflating it is too great to be feasible and the cost of engaging other balloons to remove it is so great that the inventor declares that he is unable to pay.

GALVESTON'S $2.000.000 CAUSEWAY WHICH, WHEN COMPLETED, WILL CONNECT GALVESTON ISLAND WITH THE MAINLAND.

THE CONCRETE SLAB PROTECTION ON THE ROADWAY PORTION OF THE GALVESTON VIADUCT.

THE CZAR OF CANNONS

WHAT is declared to be the largest cannon ever cast is that to be seen in the Kremlin Square at Moscow. It goes by the name of the Czar of Cannons. It weighs 2,400 puds and dates from the reign of Feodor Ivanovitch. Its cannon balls weigh 120 puds. A pud is a Russian measure of weight equal to about thirty-six pounds.

FISH DOCTORING

FISH doctoring is now going on in all the large aquariums all over the world.

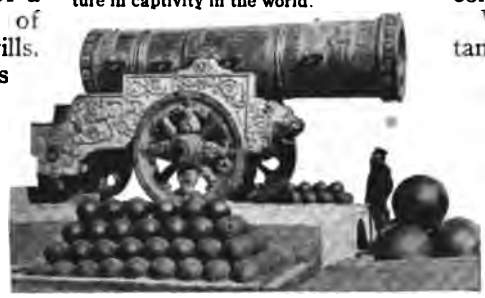
For example, it is now known that the diseased fresh-water fish derives marked benefit from a brief stay in salt water and vice versa. Such treatment, however, does not always suffice.

At times a surgical operation becomes necessary as in the case of a very bad growth of fungus about the gills. The fish which has been previously placed in the operating tank is carefully lifted out with a net. The surgeon then grasps the patient firmly with his left hand and with the scalpel removes the foreign substance. Abscesses are also lanced, but it is seldom that this proves successful and is only resorted to in extreme cases. We must here realize that a fish is a creature of the water. It is impossible for it to sustain life in the air for more than a limited period of time. Just as soon as it is removed from its natural element, it begins slowly to die.

The operations most frequently successful are performed upon fish whose air bladders fail to effect their proper functions. The chief cause of such defects is the too rapid removal of a fish from the water to the air as when it is captured, or removed from one tank to another. Its air bladder is charged to a greater or less extent with water which enables it to maintain its specific gravity in water, but the suddenness with which the fish is jerked out of its natural element prevents it from correctly adjusting the quantities of air and water in the bladder and congestion results.

When returned to its tank, the wretched creature is unable to sink or rise at will and is washed about helplessly. Fishes injured in this way can often be cured by a little massaging. The operator grasps the fish firmly with the left hand by the tail, draws it carefully out of the water up an inclined board reaching into the tank, but allowing the head and shoulders to remain submerged. Massage is then commenced toward the gills and generally after a few minutes' action of the hand, the air

MOST POWERFUL BIRD OF PREY.
The harpy eagle, recently received at the New York Zoological Gardens from South America. This bird has been known to carry off sheep and young pigs. There are said to be but two species of this creature in captivity in the world.



THE CZAR OF CANNONS IN THE KREMLIN SQUARE, MOSCOW.

LANCING A FISH IN ORDER TO REDUCE THE AIR BLADDER PRESSURE.

CHARLES DICKENS' CHALET, IN WHICH THE GREAT NOVELIST DID MUCH OF HIS WRITING.
Formerly at Gads Hill, Kent, it has been removed to Cobham Hall, Kent.

THE MOST POWERFUL FIRE-FIGHTING MACHINE IN THE WORLD.
The new 126 horsepower giant gasoline fire auto, which travels 35 miles an hour and pumps 744 gallons a minute, has just been placed in commission in New York, and is the first of its kind. The New York fire department expects to have 150 motor driven fire apparatus by the end of 1912. It is the most expensive fire-fighting apparatus in the world.

is successfully forced from the bladder. It must be stated that a convalescent fish must not be returned at once to his old tank. Either he, with his renewed vitality will evince a pugnacious desire toward his old companions, or they on their part may set upon him and slay him. At the aquarium an angel fish had to be subjected to solitary confinement because of his vicious propensities. He had killed two of his comrades and tried to do additional harm.

SIGNAL TOWER REGULATES STREET TRAFFIC

A SERIES of signal towers combined with a semaphore system is used to regulate street car traffic on the crowded corners of Los Angeles. The tower is in the shape of a box, with windows on all sides and made large enough to hold a man comfortably. As it is set on an iron post with the base of the box ten feet above the curb, it does not obstruct the sidewalk any more than a lamp post.

These towers are placed at corners where car tracks intersect, and they are especially useful at the corners where the street has a "jog" so that the intersection is made on a curve. The watchman on the tower operates semaphores which are in some cases set on top of the tower and in other cases set across the street, wherever it is more convenient for the approaching motorman to see them.

SHOOTING WILD GEESE ON THE SHORES OF DUNBURY BAY, MASS.
Five were "winged" with one discharge of the gun, as shown in this remarkable photo.

ADVERTISING WITHOUT PAPER—A PARIS SUBSTITUTE FOR THE BILLBOARD POSTER.

NEW SORT OF COMMERCIAL ARTIST

SINCE the suppression of posters in Paris, merchants, careful of their interests, have looked for a means of calling the attention of the patrons to their goods by means of pictures. Thus it is that one vendor of paints conceived the ingenious idea of giving his store-window into the hands of an artist whom we now see painting a picture thereon.

The passer-by sees at once that there he can find all the requirements for feeding a motor, if he be aviator, automobilist or mechanic; everything necessary for a laboratory if he be chemist, or photographer, all essentials for painting if he be artist, or dauber, and in fact all things necessary to the interior of any place even if it be a menagerie. This is perhaps the best way of advertising without paper.

STRAW FLOWERS

THE seedsmen's catalogues list a great variety of everlasting flowers, so called. A collection of such plants is extremely interesting, and with the flowers beautiful bouquets may be made that will keep for months without fading.

Some one wisely suggests that the ladies might wear these natural flowers

GROUP OF MANY COLORS AND VARIETIES OF STRAW FLOWERS.

They are just as picked from the garden but have the appearance of artificial flowers. They will retain their color indefinitely.

A FOUR-YEAR-OLD MOUNTAIN CLIMBER ON MOUNT BLANC.

Accompanied by her parents, little Flavia Guidini attained a height of over 10,000 feet in two days' time. The photo was taken on the giant glacier.

instead of the artificial ones that they like, but although the suggestion seems practical it really requires an avowed exponent of fashion to make the custom popular, but why should it not become popular, and why is it these flowers which in themselves are beautiful are not more extensively cultivated? Flowers that will keep their beauty from one midsummer to the next or longer surely have the advantage of the delicate ones that last for only a few days.

NOT QUITE WHAT IT SEEMS.
This is produced by printing two negatives on one paper.

row or chasing himself with the intention of committing assault and battery. In this case, one horse was used for the two pictures and the photographer's skill was employed in "making both ends meet," joining them so that no dividing line would appear.

This was a feat requiring no inconsiderable care on the part of the skillful photographer.

ON THEIR WAY

"WE don't know where we're going, but we're on our way," might be the words of the riders of this strange quadruped that is traveling north and south at once. The picture is one of the clever effects produced by the use of two negatives printed in part on one paper. Photographers find a great deal of amusement with such puzzles, one of the most familiar examples being the double portrait, in which a man is represented standing face to face with himself, wheeling himself in a wheelbarrow or chasing himself with the intention of committing assault and battery. In this case, one horse was used for the two pictures and the photographer's skill was employed in "making both ends meet," joining them so that no dividing line would appear.

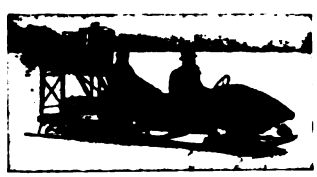
This was a feat requiring no inconsiderable care on the part of the skillful photographer.

ICE AUTOING BY PROPELLER POWER.

THE accompanying illustration shows a German gasoline ice auto in service on Lake Gorin, near Schonwalde some distance north of Berlin. The machine was constructed for the German motor yacht club of Berlin and will carry six persons at a speed of 40 miles an hour. The motor drives an air propeller.

It is said that this ice auto with one person alone on the car has attained the enormous speed of nearly 90 miles an hour under favorable circumstances.

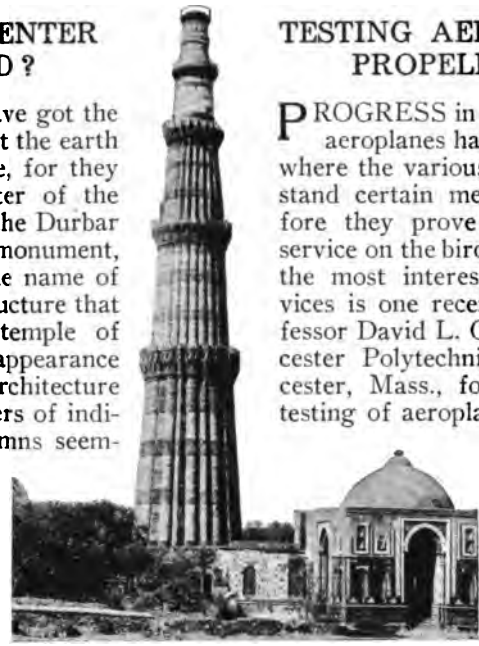
A very efficient brake has been provided which will stop the ice auto when going at a speed of 40 miles an hour within a distance of 400 feet. This ice auto may take the place of the familiar ice yacht.



OVER THE ICE BY AIR PROPELLER.

WHERE IS THE CENTER OF THE WORLD?

THEY don't seem to have got the idea over in India that the earth is not a disc but a globe, for they still talk about the center of the world. In Delhi, where the Durbar is held, stands a lofty monument, or tower that goes by the name of Kutub Minor. It is a structure that towers far above the temple of which it is a part. The appearance of this curious piece of architecture is that of a number of tiers of individual columns, the columns seemingly being tied together into bundles. At big intervals there are balconies. The Kutub Minor is of especial interest and note in the world over which the religion of the teacher Buddha holds full sway. Here long ago, tradition has it a meteor fell, sent by the ruling powers in the mystic world beyond this life to mark the center of the world. In commemoration of this miraculous event, the Kutub Minor was erected on the spot that mankind might never forget it.



BELIEVED BY DEVOUT BUDDHISTS TO BE AT THE CENTER OF THE WORLD.

It is really a very imposing looking structure, rising up in a series of fluted tiers, each tier marked by a balcony. Higher and higher it rises, tapering as it recedes from the earth, above the surrounding plain. At some little distance stands a mosque-like structure connected with the main structure through the medium of masonry work.

TESTING AEROPLANE PROPELLORS

PROGRESS in the art of building aeroplanes has reached the stage where the various parts must withstand certain mechanical tests before they prove their fitness for service on the bird machine. Among the most interesting of these devices is one recently built by Professor David L. Gallup of the Worcester Polytechnic Institute, Worcester, Mass., for the preliminary testing of aeroplane propellers.

The illustration gives a fair idea of the construction of the apparatus. It consists principally of a turntable built to revolve about a heavy steel post located a short distance from the shore in a small body of water. The turntable is built of structural steel throughout and equipped with a high power gasoline engine near the center of the apparatus and a shaft extending to one end through which the power is transmitted to the propeller to be tested.

The tests are made by starting the gasoline engine and allowing the propeller by its pressure against the air to revolve the turntable about its center support. The quality of the propeller may be judged by the speed with which it is able to drive the turntable around during the test.

TESTING AEROPLANE PROPELLERS BY MEANS OF A TURNTABLE AND POWERFUL GASOLINE ENGINE.

REMARKABLE MONUMENT TO FRENCH POET.

This beautiful piece of sculpture stands in the Cours Le Reme, Paris. It was erected to the everlasting memory of the famous French poet, Alfred de Musset, who was born at Paris, in 1810, and who died there forty seven years later. He graduated from college with high honors and in his twentieth year published his first volume of verse. He was a man of intense passions, loose, irregular habits, and a morbid, introspective mind. He was elected a member of the famous French Academy in 1852. His years were curtailed by his dissolute way of living.

TESTING A TELEPHONE POLE.

This photograph shows a machine used by the government Forest Service for testing the telephone poles required for use in the national forests. Under present conditions it is deemed absolutely necessary that all parts of a forest reserve shall be under control through a system of intelligence which has for its principal agency the talking wire. If a fire breaks out anywhere, it is especially important that headquarters shall be notified with the smallest possible delay. The poles are tested to make sure that they are not defective. They must be strong in order to resist storm winds, and it is desirable at the same time that they shall have a reasonable measure of elasticity, so as to bend rather than break.

FLOATING WATER WORKS

THE contrivance here shown is used by the Sanitary District of Chicago for watering the banks of their north channel which runs from Wilmette to Mayfair, where it joins the Chicago River.

Under the contract by which the right-of-way was obtained, the Drainage Board agreed to have sloping grass banks to the channel. Of course, grass had to be sown and frequently watered. Consequently a very great quantity of water was required. This could only be obtained from the City mains at an enormous expense, and in addition to this expense, there would be the expense of laying several miles of pipe.

By the arrangement shown the problem was perfectly solved. Sixteen empty oil barrels support a platform on which is mounted a boiler and a twelve horse-power engine. This engine operates the pumps and drives the propeller by which this queer craft is moved along. The pump is powerful enough to supply several hose nozzles, and the water of course, is drawn directly from the canal.

The captain of this peculiar ship starts getting a supply of coal on board, and firing up at about 4 P. M. He is ready to begin his voyage about 5, and by 2 or 3:00 o'clock in the morning he has watered nearly 300,000 square feet of bank.

FLOATING WATER-WORKS.
This strange craft is maintained to water the grass of a canal's banks by night.

TRAMP SIGNS.
1. "grouches"; 2. a crime has just been committed; 3. look out for jail; 4. "nothing doing;" 5. give out feed here; 6. easily frightened; 7. policeman lives here; 8. defend yourself; 9. you may sleep here; 10. dog; 11. man is brutal here; 12. give money here; 13. brutal people and dog; 14. the woman is alone with a servant; 15. "easy marks;" 16. they give to ill people; 17. be insistent; 18. be religious.

GIVES UP SOCIAL POSITION TO LEARN CABINET TRADE.
Mlle. Bernstein, the 17-year-old daughter of the prime minister of Denmark, who has just apprenticed herself to a cabinet maker. She works from six in the morning till six at night.

THE YACHT *ALVINA*, WHICH BORE THE BENEDICT EXPLORING PARTY FROM NEW YORK CITY TO THE UPPER AMAZON.
It is hoped that important zoological and geographical information may be discovered by this expedition.

THIS CRANKING DEVICE ELIMINATES THE DANGER OF THE ENGINE'S BACK FIRING.

BERLIN'S NEW VON HALLERITH ELECTRICAL CENSUS MACHINE.
It sorts and adds with mathematical accuracy 230 cards a minute.

NEW CRANKING DEVICE FITTED TO THE AUTO.

CRANKING WITH DANGER ELIMINATED

THE next best thing to a self cranking device for an automobile engine is a means of cranking the motor by hand with the usual labor lessened and the danger from backfiring of the engine removed. Such a device has just been produced by a manufacturer of a shock absorbing mechanism and to some extent the new cranking apparatus operates along the same lines.

In order to reduce the labor of turning the engine, over gearing is arranged so as to give about a two to one reduction of the power usually required for the operation. Beside this the device is so constructed that a rachet holds the crank from backing in case of a premature explosion in one of the cylinders of the engine. In case such an explosion occurs only the larger of the two reducing gears which holds to the shaft of the engine, turns, the smaller one being connected to the crank through a friction mechanism permitting the crank to remain stationary.

The apparatus can be fitted to any car without a change in its construction and in view of the fact that many of the so-called self-cranking devices are not altogether satisfactory the new safety crank is likely to meet with a ready sale.

This device should keep the novice out of danger, who too frequently receives bruises or even a broken arm from backfiring of the engine, while he is straining, with might and main, to get the perverse engine to start.

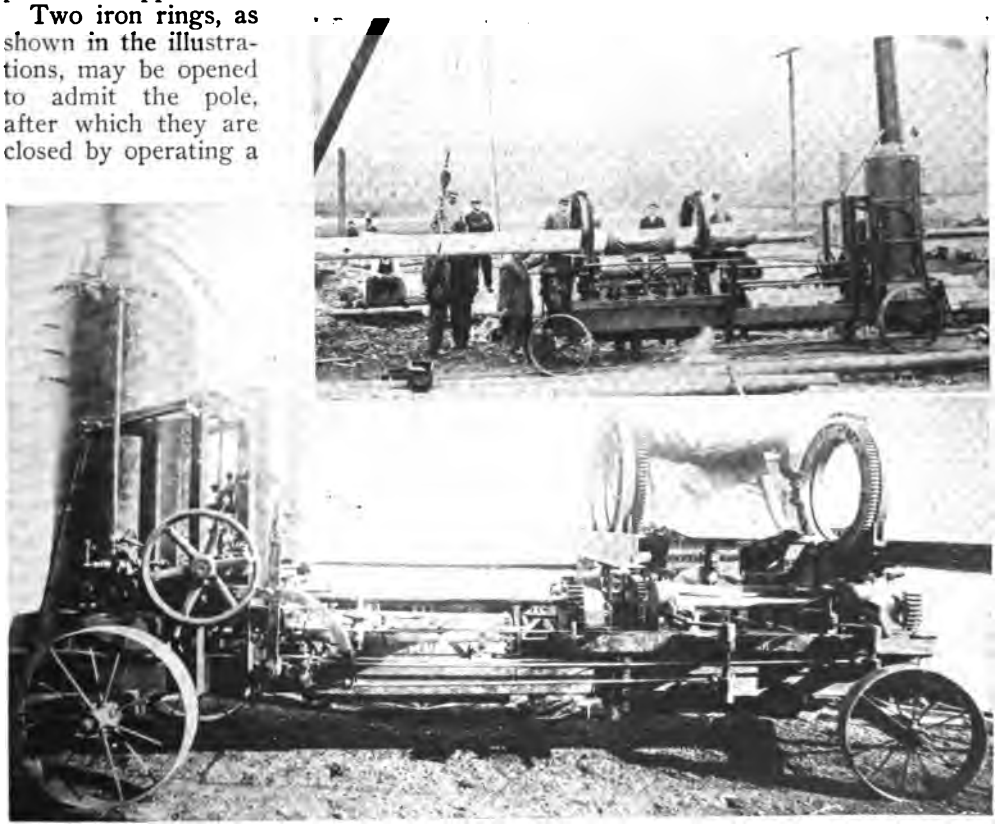
MACHINE FOR CREOSOTING POLES

IT is at or near the ground line that a pole is most subject to decay, for here it is exposed to moisture of the ground and to the air as well and hence provides an excellent place for destructive insect life. In order to preserve the pole against decay, it is unnecessary to treat more than a limited zone in the neighborhood of the ground line. Recently a machine has been perfected with creosoted oil, or other preservatives. The oil is forced into the wood by means of air pressure. The machine, as shown in the accompanying illustrations, is provided with a boiler for generating steam with which the air compressor is operated and with which steam coils are heated to warm the oil that is stored in a reservoir in the middle of the machine. A pair of iron skids will be observed extending crosswise of the machine, and upon these the poles are supported.

Two iron rings, as shown in the illustrations, may be opened to admit the pole, after which they are closed by operating a hand wheel. A spool bearing a canvas band three feet wide is then revolved by a hand wheel so as to wrap the cloth

OFFICIAL WASTE BASKET SEARCHERS.

Miss Kate Shea (left), and Mrs. Mary Warren (right), hold these peculiar positions at the Treasury Department in Washington. Mrs. Warren has been so employed for 40 years. She has rescued in this time nearly $1.000.000 in money and bonds. She once found $10.000 worth of bills in a package. Miss Shea has been her assistant for 10 years.



MACHINE FOR TREATING WOODEN POLES WITH CREOSOTE AS A PRESERVATIVE.

A REMARKABLE BOLT OF CHAIN LIGHTNING.
This photo, snapped at Perth, North Dakota, shows the lightning breaking from clouds to earth in two outlets.

tightly about the pole. The edges of the band are reinforced to make a snug fit and they are subjected to air pressure so that the band will form an air-tight ring-like bag about the pole. This done, the heated oil is introduced into the bag through a pipe under a pressure of about five pounds to the inch. It has been found under test that a 10-minute treatment is sufficient to force about a gallon of oil into the pole.

The oil is forced into the wood to an initial depth of about one-half inch. After the pole has been treated, the spool is revolved to unwrap the cloth band from the pole, the rings are opened and the pole is rolled off the opposite end of the skids. A pan is located under the band to catch any oil that may drip from the cloth or that might ooze out through checks in the wood during the treatment. The machine shown in the illustration handles poles from seven to twenty-four inches in diameter.

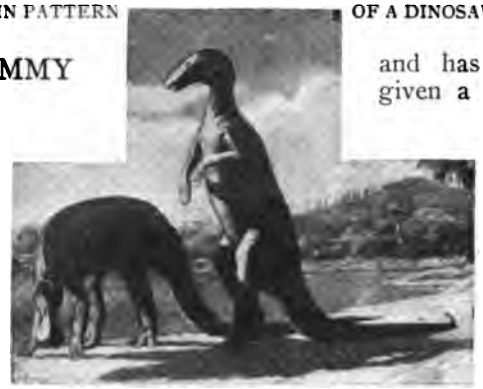
HUGE NEW GUN FOR THE BRITISH NAVY.
It is typical of the new armament being introduced for England's defence.

A MIRAGE OF THE DESERT.
The picture had clearly caught the appearance of trees and water in the distance, but on approaching to this line of trees it was found to be merely a mirage. These mirages are often found in Arizona and the Southwest, generally on very flat surfaces of sand and alkali, on extremely hot days.

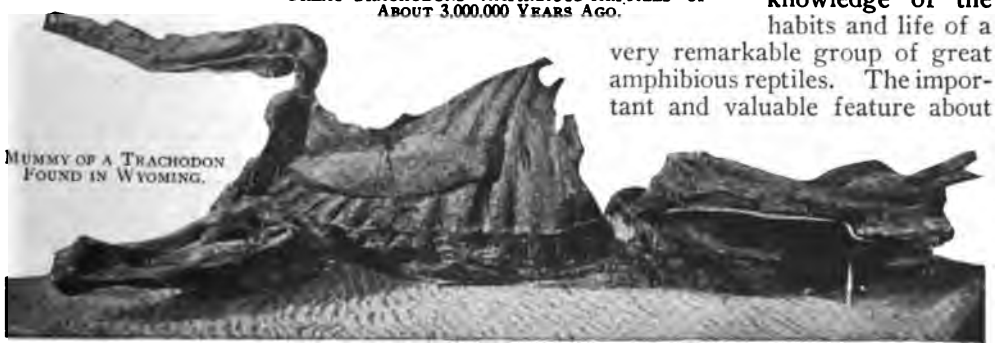
SAID TO BE THE FIRST SKIN PATTERN OF A DINOSAUR EVER DISCOVERED.

DINOSAUR MUMMY

IN acquiring this great "find" of a mummy trachodon and exhibiting it, Prof. Henry Fairfield Osborn of the Museum of Natural History, New York, has made a noteworthy contribution to science and has at the same time given a most impressive exhibit to the general public. In fact, the surprising revelations which have been brought to light by a study of this skeleton furnish a new and fascinating chapter which nearly doubles all previous knowledge of the habits and life of a very remarkable group of great amphibious reptiles. The important and valuable feature about



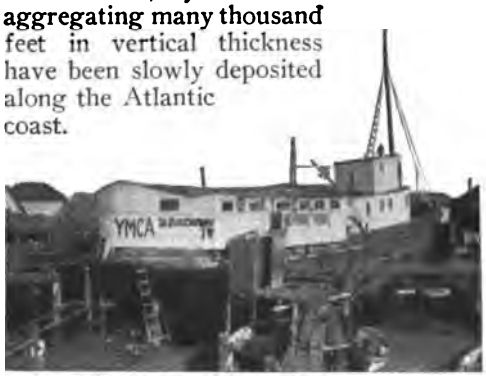
GREAT TRACHODONS—AMPHIBIOUS REPTILES—OF ABOUT 3,000,000 YEARS AGO.



MUMMY OF A TRACHODON FOUND IN WYOMING.

THE PARTS OF THE POCKET DOOR LOCK.

this unique specimen is that it presents a complete cast, with absolute distinctness, of the hitherto practically unknown outer covering of these herbivorous dinosaurs belonging to the closing period of the age of reptiles. During the upper cretaceous period, according to geological reckoning, about three millions of years ago, these huge kangaroo shaped, water-inhabiting creatures were very abundant in western North America. They were from fifteen to sixteen feet or more in height, and measured some thirty feet in length. The skeletons, or hard parts, have been known for a number of years, having been found by Prof. Cope, the pioneer fossil explorer and scientist, and by others. The Museum has mounted in its striking trachodon group a fine Cope specimen, represented in feeding posture. Trachodons lived near the close of the Age of Reptiles in the Upper Cretaceous and had a wide geographical distribution, their remains having been found from New Jersey to Montana. A suggestion of the great antiquity of these specimens is given by the fact that since the animals died, layers of rock aggregating many thousand feet in vertical thickness have been slowly deposited along the Atlantic coast.



COMBINED CHURCH AND Y. M. C. A. HOUSE ON A BOAT. Where the lowly fishermen of San Pedro Bay, Cal., may keep in touch with the better life.

POCKET DOOR LOCK

IN many hotels in small towns the locks of the guests rooms are defective or lack keys, and as a result many losses of clothing and valuables occur to the great annoyance of the guests and in some cases considerable expense to the landlord.

For the protection of the traveler in such cases a well known lock maker has brought out a device by which a door already provided with a lock-plate in the jam may be securely fastened.

It consists of a small strip of steel

THE POCKET DOOR LOCK IN PLACE.

called a bolt bar at one end of which is located a false bolt which fits into the lock-plate in the door jam in such a position that the bolt bar will lie flat against the jam and come between it and the door when the latter is closed.

Along the bolt bar near the opposite end of the false bolt are cut a number of slots. The door is shut holding the plate between it and the jam and a lock so made that it slips over the bolt bar, is fitted snugly against the edge of the door and the key in the lock turned.

The cylinder of the lock carries a disc which fits into the slot in the bolt bar nearest the edge of the door and holds it securely, as shown in one of the illustrations. The device is small and can be readily carried in the pocket.

USED TO LIGHT THE STREETS OF PARIS IN THE SIXTEENTH CENTURY.

TWO KINDS OF LIGHTING

THESE two illustrations show two remarkable contrasts of the system of lighting as it was carried on in the French capital between three and four hundred years ago and as it is today in the city of Heidelberg, Germany. The first and the last have one feature in common, however; they are not connected with any central system to furnish the source of illumination—a curious indication of how, to a certain degree, civilization, even of the material sort seems to move in a circle, more or less. In the days of the Louis's a basket made of iron was hung out from a stout post, into this basket or brazier resinous faggots were placed from time to time, as the sleepy householder might deem best. They were not kept burning very far into the night, however, and were rather of service to the cutthroat and footpad than to the honest citizen. The outlaw had an excellent opportunity to study his victim by the flickering rays. The second illustration shown is that of an acetylene generative gas lamp, as used to advantage in the city of Heidelberg as a supplementary lighting system.

THE MOST STUPID OF ANIMALS, PIGS, TRAINED BY A GERMAN, FOR PUBLIC EXHIBITION IN BERLIN AND ELSEWHERE.

A GENERATIVE GAS LAMP USED IN HEIDELBERG, GERMANY.

PUNCTURE PROOF AUTO TIRE

A CHICAGO architect, John B. Fischer, thinks he has perfected what countless other inventors have endeavored to produce ever since the automobile became a common form of conveyance—a pneumatic tire which is practically immune from puncture. He has worked a long time on his idea, which is unusually ingenious.

Unlike the ordinary tire, which is composed of a single case tube, the new tire

is formed with a plurality or series of cavities, rounded or spherical in shape, located within the tube around the circumference and separated by intermediate walls or spacers. The tube containing these cavities is constructed by taking a plurality of layers of fabric and rubber applied to a mold or form to give the desired corrugated or rounded shape for cavities. In the depressions between the corrugations are located triangular or crescent shaped pieces of what is known as cushion stock, which is inclosed in a covering of several layers of fabric and rubber, while over all additional layers of fabric and rubber are then applied, making a substantially smooth external appearance with the two lips or flanges at the inner periphery.

NEW PUNCTURE-PROOF TIRE FOR AUTOMOBILES.
The inner tube is composed of a series of inflated balls separated by rubber walls.

Resilient balls are inserted in the spherical cavities where they are securely held by the walls of the spacing pieces. In order to remove or introduce a ball, the casing is detached for a convenient portion of its length and the flanges and lower portions of the spacers spread apart to the extent required. After a ball has been thus introduced and the casing parts released, the ball will be completely enveloped in the casing, and by it securely held in place.

On account of the location of the balls it will be difficult for a puncturing object to reach them, but in case one is actually punctured it alone will become deflated, and only a very small portion of the tire is affected. Under ordinary circumstances the tire would not be put out of commission even if a number of the balls were punctured. But 50 square inches of the tire are are subject to puncture as against 1,000 square inches in the ordinary tire.

Among other advantages claimed for the new tire are: freedom from nipping of the air tube by the tire removing lever; prevention of rim cutting and blow outs, for the reason that the tire never flattens, and prevention of what is known as the side roll, which results from turning corners and in skidding.

If this tire but partially achieves its inventor's purpose it will be a great boon to the autoist. There is nothing more annoying than a puncture.

HUGE BUCKET EXCAVATOR

THE construction of railways and canals entails the design of more and more powerful bucket excavators. The one illustrated has been recently installed in Germany and claims the honor of being the largest in the world. It is a gigantic gantry excavator with two discharge openings, the valves of which are operated by oscillating compressed air cylinders fed by an electrically driven air pump. Its maximum dredging depth is about 70 feet. The opening of the gantry is 10½ feet above the level of the track and about 11½ feet in width. The speed of the bucket chain is so designed that 32 buckets are discharged per minute, resulting in a theoretical output of 960 cubic meters per hour.

GIGANTIC BUCKET EXCAVATOR IN USE IN GERMANY.
It is asserted to be the biggest in the world.

The buckets are discharged alternately into either of the two railway trains installed in the opening of the gantry and behind it respectively, the direction of discharge being controlled by means of a valve, which is operated by the hand.

LAUNCHING AN AEROPLANE FROM A WIRE.
Getting ready for the start.

AEROPLANE STARTS FROM WIRE

THE navy's new Curtiss hydro-aeroplane was recently launched from a wire cable. This experiment was under the direction of Lieut. T. G. Ellyson of the navy, who was the first member of that branch of the military service to become a qualified aviator.

The object of this unusual method of starting an aeroplane was to demonstrate the practicability of the hydro-aeroplane for use on ships of the navy by the launching of the same quickly and easily by means of wire cables available on board any vessel of the navy, and thus do away entirely with anything in the way of a platform.

It is claimed that this successful test as carried out removes the most serious obstacle which hindered the launching of aeroplanes from warships. A hydro-aeroplane may thus be launched at sea under any conditions, without the loss of time in putting it overboard to arise from the water and without delay because of rough sea. These experiments may do much toward solving certain modern naval problems.

RISK LIVES FOR 12 CENTS A DAY

IN the graphite mines of Ceylon men, women and children are employed, and the pay they receive would astonish an American miner, being about 12 to 24 cents a day for men; women receive about 6 to 16 cents per day for their services, all work being done under a contractor who keeps the wages down as low as possible. The iron law of competition in labor is enforced to the limit in Ceylon.

The graphite from the mine is hoisted by means of a simple windlass in barrels and then transported to Colombo, a seaport town, and then prepared for shipment to the various markets of the world, where it is manufactured into goods for various uses.

The structural work of the mine is of the most primitive and frailest material, and it is remarkable that a far greater loss of life does not take place between these great walls of graphite. Artificial ventilation is unknown in the galleries of these mines and the miner of Ceylon will not venture where a light will not burn and for this reason it has been

THE LAUNCHING.

THE GRAPHITE MINES OF CEYLON.

TREE CLIPPED TO SHAPE OF BOTTLE.

THE RESULT OF CONTINUOUS CLIPPING AND TRIMMING.

necessary to abandon a great many parts of the mine.

Upon reaching Colombo, the material is given a final sorting, being graded into something like 35 different grades, all being done by hand with a simple screen, while children and women separate it from foreign substances by small iron hatchets. It is separated into large lumps, small lumps, chips, dust, and a finer material called "flying dust." In this grading process, water is used by some of the mines, and it hastens the work as the large pieces immediately sink to the bottom of the tank, and all is later exposed to the drying influence of the sun.

ODD DESIGNS IN TREES

THE southern countries of Europe, notably Italy, have long been famous for the beauty of their gardens and the large amount of fine topiary work—as the art of scientific tree-trimming is sometimes, though not often, called—in them.

In England, on the other hand, formal gardening on an extensive scale, is of comparatively recent origin. The rigors of the northern climate, the smoke from the factories of the cities and the irregularities of the land were obstacles which the gardeners of southern Europe did not have to overcome. Time, however, has taught the English gardener the trees and shrubs that thrive in his land and the country houses of England now boast of gardens which take their place among the most famous gardens of all Europe.

Evergreen trees and shrubs trimmed into odd and sometimes fantastic shapes play an important part in the scheme of general gardening. The pictures of a corner of the noted garden at Levens Hall, Westmoreland, furnish fine examples of topiary art. One illustration, shows the results of continuous clipping and trimming. Another photo shows an odd and quaint design, that of a bottle, complete even to the presence of a stopper.

These fantastic shapes, however, are more curiosities than real works of art.

BUST OF HISTORIC INTEREST.

When Napoleon returned from Elba, the French government ordered five busts of the great conqueror to be made, for the five principal provincial cities of France. They were sculptured at Marseille, and were exactly alike. But before they could be delivered the Battle of Waterloo was fought, and the returning Bourbons gave orders that they be destroyed. Fortunately, this was prevented by the American consul at Marseille, whose name was Hodge. He bought all five of the busts for a small price, and brought them to this country. The bust above is at the War College in Washington.

HEADQUARTERS OF THE CHINESE REVOLUTIONISTS IN NEW YORK CITY.

A flag with a curiously shaped star in the upper corner has been adopted.

A JAPANESE STRONG MAN IN BERLIN, BY RAISING HIS BODY, BENDS AN IRON ROD HELD BETWEEN HIS TEETH, THE ENDS BEING HELD BY THE TWO MEN AT THE SIDES. HIS FEAT IS AN UNUSUAL ONE.

NEW WAY TO COAL VESSELS

THE coaling vessel here shown represents the most improved boat which has been built for that purpose. It eliminates all the inconveniences which had to be endured at the coaling of a steamer on the old style. It prevents the dust to cover the vessel from one end to the other, soil the sailors' and passengers' clothes and get into the lungs of all.

This vessel has a capacity of 400 tons and is fitted with two elevators of a capacity of 100 tons per hour each, together 200 tons per hour. From one end of the coaler to the other is a longitudinal passage which the movable elevators are free to travel. Larger vessels are fitted with more of such elevators. The big

FOR HAULING THE AMERICAN MAIL.

This locomotive is one of the heaviest which has yet been built in Great Britain. Its 6-coupled wheels are each 6 ft. 7 in. in diameter and the four bogie wheels are 3 ft. 7 in. The boiler has a barrel 13 ft. 9 in. in length, 4 ft. 10¾ in. in outside diameter and the working pressure amounts to 200 lb. per square inch, while the grate area is 31.5 square feet. The locomotive has a length over buffers of 63 ft. 0¾ in. and the tender carries 4,500 gallons of water with a space for 5 tons of fuel.

A NEW SYSTEM OF BUNKERING STEAM SHIPS. A thousand tons may be delivered hourly.

liners, such as the *Lusitania* and *Mauretania,* could thus be coaled at a rate of 1,000 tons per hour.

A thousand tons per hour may appear a very large quantity of coal to transfer from barge to steamer, and it can only be done by a system such as the barge shown is constructed on. To attempt to pass that quantity of coal down one chute, or even two chutes, would mean that the discharge would have to be so rapid that the delivery of it could not properly be taken. In the arrangement of this barge, however, different chutes are put through the side bunker doors in different parts of the vessel and the coaling operation is thus going on simultaneously in practically all parts of the vessel's bunkers.

¶ This is our ninth birthday.

¶ We are eight years old and proud of it.

¶ It is something even to be alive at the end of a period which has seen such frightful infant mortality in the magazine nursery. Scores of bright-eyed young periodicals have grown blue in the type-face and passed away during the last eight years from defective circulation.

¶ To survive at all is proof of a good constitution.

¶ To have grown constantly stronger in influence and in circulation justifies complete confidence in the vitality of the idea on which the Technical World Magazine is founded:

¶ *The most interesting thing in the world is the story of man's ceaseless and successful endeavor to harness and tame to his own uses the tremendous forces of Nature.*

¶ During the eight years which cover our span of life, the inventors, the scientists and engineers—all the gentleman adventurers of the new democracy—have pushed far forward into the realms of the unknown.

¶ The air has been conquered. The skies are full of bird-men.

¶ The depths of the ocean have been invaded by submarines which travel a thousand miles under their own power.

¶ The explosive power of gases has been used to send a million men flashing back and forth on their daily errands.

¶ Tremendous steam engines, creaking and snorting, have given way to tiny, silent turbines.

¶ Electricity has been sent through the pathless ether to explode torpedoes and guide boats on their desired courses—to carry messages over mountain ranges and across the ocean.

¶ Wherever water runs down hill the power of the "white coal" has been put to turning wheels and spinning turbines.

¶ Of cement and sand and water a liquid stone has been mixed, which hardens overnight into indestructible towers and houses and great sky-scrapers.

¶ Men speak with each other through the vacant air across miles of space.

¶ Invisible power is carried hundreds of miles over country on small wires and delivered instantly at a thousand scattered points.

¶ The microscopic germs which are man's most relentless enemy have been brought under man's control.

¶ The farmer has been taught how to master the seasons and force the earth to yield its increase.

¶ To-day the world trembles on the verge of discoveries which may double the field of knowledge and the capacity of the human race.

¶ People who read the Technical World Magazine regularly keep abreast of the van of progress.

¶ They find in it every month the latest news bulletins from the battle front.

¶ And more than fifty per cent of them renew their subscriptions year after year.

¶ Is there any other magazine anywhere which can truthfully make the same statement?

NEW SAFEGUARD FOR THE AVIATOR.

PARACHUTE FOR AEROPLANISTS

THE necessity for a safety device to protect aeronauts in case of accidents to their machines is universally recognized. The ordinary parachutes used by professional balloonists will not answer the purpose because in the first place the aeronaut guiding an aeroplane has too much to do and too much attention to pay to different things to burden himself with an apparatus requiring considerable room and attention. In the second place a parachute is of great value when the aeronaut knows at what time he wants to detach himself from his machine, but of very little value in the case of a sudden and unexpected fall. A young Berlin engineer has invented a cloak which seems to answer all requirements. It can be worn like a cape, is not heavier than an ordinary overcoat, and does not impede the movements of the wearer. As soon as the aeronaut begins to drop, it opens automatically, and is strong enough to break the descent so that the wearer glides down easily, and all danger of a sudden fall is obviated.

NEW AUSTRIAN ARMORED MOTOR FOR DEFENSE AGAINST FLYING FIGHTERS.
Means of protection against aeroplanes still absorb the attention of European military experts.

NOVEL FORM OF AEROPLANE.
This machine is the invention of an Englishman and has a sort of turbine in the head instead of a regular propeller.

Next Month's Features—See Next Page

Technical World Magazine

HENRY M. HYDE, Editor

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Technical World Magazine should be on the news-stands on the 17th of the month preceding the date of issue. Patrons unable to get the magazine on the 17th will confer a favor by notifying the Circulation Manager. News-stand patrons should instruct their News-dealer to reserve their copy of Technical World, otherwise they are likely to find the magazine "sold out".

TERMS: $1.50 a year; 75 cents for six months; 15 cents a copy. Foreign postage, $1.00 additional; Canadian postage, 50 cents additional. Notice of change of address should be given thirty days in advance to avoid missing a number.

TECHNICAL WORLD COMPANY

58th St. and Drexel Avenue, Chicago — 1702 Flatiron Building, New York

Entered at the Postoffice, Chicago, Ill., as second-class mail matter.

TECHNICAL WORLD MAGAZINE FOR MAY

WHAT STEEL DIVIDENDS COST

By

HENRY M. HYDE

The firm of J. Pierpont Morgan got $70,000,000 for organizing the Steel Trust. On this and the rest of its stock—watered and otherwise—the Steel Trust has made in ten years a billion dollars in profits. And 23,000 men employed by the Steel Trust work twelve hours a day and seven days a week—except once in two weeks, when they work twenty-four hours out of one day when the gangs are changing. Commercial supremacy comes high!

TOWN WHERE TRUSTS DON'T RULE

By

CHARLES DILLON

Sabetha, Kansas, with but 2,000 inhabitants, is a peculiar place. It isn't socialistic, it hasn't any radical form of government. Yet it is probably the best governed community in the country. For instance, while the rest of the nation did homage, the past winter, to King Coal, Sabetha with its own municipal heating plant kept its fearless independence. Strangely enough, too, not one lawyer is to be found in this little Kansas town.

THE INVISIBLE DETECTIVE

By

CHARLES FREDERICK CARTER

The dictograph, that mute but wonderfully efficient listener, has figured successfully in over a thousand cases where first-hand evidence was imperative. Mr. Carter, in his usual clever style, presents in an absorbing way, some of the more striking instances of this automatic detective work.

MINING FOR TIGERS

By

C. F. HOLDER

An asphalt trap in California began over a million years ago to ensnare the great sabre tooth tiger. From that day to this all kinds of animals have here met their death.

TECHNICAL WORLD MAGAZINE

VOL. XVII · APRIL 1912 · NO. 2

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The BROTHERHOOD

WHO makes the price of wheat?

Thirty years ago David Lubin, by nativity a Pole, by religion a Jew, by adoption an American, began asking himself that question. Graduated from the ghetto of New York, he had drifted to California, developed into a wealthy merchant, and became inspired with the purpose to serve his fellow men.

California was the finest wheat country in the world, yet it could not raise wheat at a profit because "the market" was against it. Lubin wondered what "the market" might be, and why it prevented California from raising wheat that millions of people needed.

He set out to answer the riddle. Other men had been asking the same sort of questions from the dawn of economic science. Lubin went about it in a new way, and found the answer. That made him different.

But he did more. Having his answer, he determined that the thing he had discovered should be of service to the whole world. So he carried his riddle and its answer to the kings and parliaments of the world, convinced them that he was right, and founded the Parliament of Man, the first Federation of the World.

The International Institute of Agriculture is the formal title of this ambitious child of David Lubin's practical imagination. It is with this Institute and the remarkable man who founded it that I have to deal.

The International Institute has undertaken, with the backing and co-operation of fifty nations, to solve the cost-of-living problem in thoroughly practical fashion; to free agriculture and its products from thralldom to the powers of speculation; to make the soils of the world just as productive as possible, and to take their products to the hundreds of millions who need them, at living, reasonable prices. Publicists, economists, statesmen, philanthropists everywhere have long since hailed Lubin's plan as the beginning of intelligent effort to free man from the rule of avarice and greed.

All, that is, save Americans. Truly, the prophet is not without honor, save in his own country. America, the greatest food producing and exporting country, has been last to realize and recognize the importance and potentiality of the Institute which has been established at Rome, and in which every first- and second-class nation and most of the third-class ones have united together. Never in the world's history has a like purpose brought so many of them together in a great common purpose.

Properly to describe the great project of co-operative supervision, extension and improvement of agriculture, is impossible without telling of its conception. The man and his work must be presented together.

Therefore our story opens upon the boy in the Ghetto. His father had died in Poland when David was a child, and his mother had brought her children to America. The boy learned the tailoring trade in a New York sweatshop, and when his sister married Harris Weinstock, and went to San Francisco to live, young David presently followed.

At seventeen we find him alone in the desert, a gold seeker. There, under the brazen sky by day and the stars by night, everything introspective and contemplative in this child of Israel was brought out. Always mystical and self-analytical, he now became fascinated with the thought of being alone with God. The idea that God and One make a majority became strong in him. He even dared hope that he might be the One. No conception of a mission had yet reached him. But those months of solitude burned out of his nature everything trivial or selfish. He became imbued with thought of a

OF BREAD

By JUDSON C. WELLIVER

great duty which sometime, somehow, he must perform. He went back to the city a man, not a boy filled with the inspiration of a great if as yet undefined purpose.

At Sacramento he started a poor little store. In the basement under it was a Chinese laundry; over it, a bad boarding house where he ate when he had the money. A sidewalk on stilts ran by the place, at the level of his store. Here he worked and starved, waiting for business that never came. He was almost in despair when he got the Sacramento agency for a new make of overalls. Sacramento was headquarters for railroad construction, mining and ranch supplies, and the new overalls, the best that had ever been brought into the country, began to sell. Their fame reached all the camps, and men came miles for them. Prosperity seemed determined to pick David Lubin for her own.

One day a huge, red-faced, ham-fisted Irish railroad foreman clumped down the stilted sidewalk with a business proposition.

"You've got th' best ov'ralls that was iver brot into Californy," he began. "Ivrybody's got to have 'em. Give me tin cints on ivry pair ye sell, an' I'll get yez all th' business in th' valley."

Lubin knew the man could do it, but he promptly replied:

"I'm selling these overalls as cheap as I can, and I'll give no rakeoffs to get business. Now get out, and don't come here for any more goods, for I'll not sell you any."

Whereupon the Irishman, swearing vengeance, left the place. "But I'll come back, Jew," he said as he slammed the door.

And sure enough, three days later Lubin heard the Celtic clump of those same cowhides. The Irishman was coming, but not alone. Lubin hid in the darkest corner and waited for the trouble.

He had not mistaken. Headed by the hulking foreman, the gang burst in and demanded:

"Where's the Jew?"

Lubin cowered in his dark corner; but the big foreman's eyes were too sharp.

"There he is, byes, in th' corner; there's the Jew; drag him out, an' make him sell ye thim ov'ralls. They're the best that iver came to Californy, an' he's the only honest Jew that iver came out o' Palestine. Here, come out an' show th' byes yer goods."

Getting a grip on Lubin's coat collar, the Irishman yanked him out of hiding and pitched him behind the counter. With trembling hands, Lubin got down the sublimated overalls, while the red-faced terror turned salesman! In ten minutes the Irishman had sold two pairs to each of the twenty men, Lubin had his money, and the inundation had rolled on!

And as the cowhides clattered away down the board-walk, Lubin heard the big voice again proclaiming:

"There's an honest Jew, byes, an' he sells honest goods fer honest prices!"

From that day the business grew by leaps and bounds. They used to say in Sacramento that Davy Lubin couldn't keep the money away. His brother-in-law, Weinstock, later came in, and it became Weinstock & Lubin, of Sacramento and San Francisco. The Irishman's report that Davy Lubin was an honest man traveled wide.

But prosperity was not the purpose that had been burned into David Lubin's soul under the blazing sun and shimmering stars of the desert. It was his duty not to prosper, but to serve.

One day Lubin went to his partner and said, "Harry, I am going into the fruit business."

"What for? You'll lose all you've made. Fruit's no good here; it rots on the trees; the pigs eat what they want,

DAVID LUBIN.
The California Jew who has answered the question: "What makes the price of wheat?"

and nobody cares for the rest."

Lubin knew there was no money in fruit. Railroad rates were too high and facilities inadequate. But back East, millions of people wanted it. He would find out why it couldn't be got to them.

So he bought fruit lands, planted the best varieties, and convinced everybody that he had gone stark mad. While others were getting out of fruit, Lubin was getting into it on an unheard-of scale.

In due time the ranch produced such a crop as the valley had never known, and Lubin went to the Southern Pacific and learned its rates on shipments to the east.

"Too high," said he. "I can't pay such rates and sell my fruit, except at a loss."

"Well, they are the rates; you can pay them, or keep your fruit."

Then Lubin went up to headquarters; to the mighty Huntington, California's master of highways and gateways. "You're killing the goose without even giving it a chance to lay its golden egg," he said. "Reduce your rates, give the fruit raisers a chance to consolidate their shipments, help them to organize a big co-operative scheme to market their products, and this fruit business will become the greatest revenue producer the road will have."

Huntington listened. Lubin outlined the plan on which he had long been studying, of bringing the fruit-growers of California together in a great co-operative association; getting them to syndicate their shipments so as to make up carload and trainload lots, so that the very lowest rates could always be assured; uniting together in selling through common agents, to whom all the shipments should be made. In short, Lubin laid before Huntington the rough outline of what has since grown into the California Fruit Growers' Association, the biggest, richest and most powerful co-operative society in the world, controlling the vast fruit product of California, shipping it to the ends of the world, dominating markets, maintaining its own financial arrangements, and dealing to the extent of many millions every year. It brought prosperity and stability to the fruit industry, and vast wealth to the state.

Huntington saw that it was good. He joined Lubin, encouraged him with promise of favorable rates if the business could be consolidated into big instead of small shipments; and in the end the project was carried to a splendid success.

Lubin had done his part. He had found a way to get California's excess of fruit to the markets that wanted it. He lost some money in his fruit venture, but he solved the problem for the rest of the state. That done, he disposed of his fruit lands, and went back to the big merchandising business in Sacramento and San Francisco, that persisted in growing greater and more profitable year by year.

But not for long. The flood of prosperity gave him pause. He was not doing his share for other men. Casting about him, he saw that the California wheat growers were not prospering. The world needed the wheat but something was wrong. Between the grower and the user, there was somehow or other so

much difference that the grower generally lost money, and the user had to pay very high prices. So Lubin decided to find out; and again he began at the bottom; he bought wheat land and raised a crop.

At that time California wheat was almost unknown in the States. It was grown on great ranches, and shipped through Port Costa, on San Francisco Bay, to European markets. The excessive rates of the Southern Pacific, the competition of wheat-growing countries nearer the great markets, the high cost of shipping by either rail or water, and especially the uncertainties of speculative markets, were ruining the Pacific coast growers.

So when his first crop of wheat was ready—and it was a magnificent one—Lubin set out to locate and analyze the World's Wheat Market. He took samples of his wheat to the Port Costa dealers, and demanded to know what they would pay for it.

"Sixty-seven cents a bushel."

"Is that all? Why don't I get more?"

"Because that's the market," lucidly explained the dealer. Lubin wanted to know what the market was, where it was, and who made it.

That was too much for either the good nature or the risibles of the dealers. They assured Lubin that he was displaying all the evidences of insanity.

"No, I'm not crazy; but I want to know who makes the price on my wheat," he persisted.

"Well, we don't know; but that's the price, and you can take it or leave it. Can't tell you who makes the price; probably the Chicago Board of Trade; we get our quotations from them.

An hour later, our boy of the Ghetto and the desert was en route to Chicago, to see the Board of Trade and find out who made the price of wheat. He found the president and secretary of the Board of Trade, and demanded:

"Why don't I get more for my wheat?"

VICTOR H. OLMSTED, CHIEF OF THE U. S. CROP REPORTING SERVICE.
He is a delegate to the International Institute of Agriculture, Rome, where nearly fifty nations are represented.

THE NEW YORK STOCK EXCHANGE WHERE LUBIN COULD NOT LEARN "WHAT MAKES THE PRICE OF WHEAT?"

"Can't tell you; we don't fix the price of wheat in Chicago," they explained.

"Then who does fix it? When a man makes a plow or a pair of shoes, he makes the price, and I pay it. But when I make wheat, I don't fix the price, and I can't even find out who does. Who decided that my wheat was worth sixty-seven cents in San Francisco?"

The Board of Trade officials weren't sure; Chicago got its quotations from the New York Produce Exchange. "You'd better go and see the Produce Exchange," they advised him.

In half an hour, Lubin was on train for New York. There his experience was a repetition of what had befallen in San Francisco and Chicago. The big men of the Produce Exchange didn't fix the price, and couldn't tell who did. They hadn't thought much about it. But every day they got quotations from Liverpool, and perhaps in Liverpool Mr. Lubin could learn what he wanted.

The first steamship had Lubin on its list. He saw the officers of the Liverpool exchanges, and was duly assured that they didn't make prices. They talked much about supply and demand, and would have had their inquisitor believe that nobody made the price of wheat, but that it was mysteriously precipitated out of the atmosphere, like rain. That was rather too penumbral for the man who simply wanted to know:

"Why is my wheat only worth sixty-seven cents in San Francisco? Why does the man who produces plows and shoes and shirts make his own price, while the man who produces wheat takes the price somebody else makes?"

The Liverpool people said they received crop reports from all the world; and they didn't attempt to pass him along to somebody else, as San Francisco and Chicago and New York had done. Wherefore Lubin became convinced that his answer was right here in Liverpool, and set about to find it.

The story of his inquiries is not important to us; their result is. He found that in Liverpool a small group of men controlled private systems for gathering crop information from the whole world. These called themselves dealers; other people called them speculators; Lubin decided they were gamblers. The information was carefully guarded, and the public received only such condensations and synopses as they chose to give out. For the greater part, the crop information trust didn't take the world into its confidence. It made the primary quotations which became the basis for San Francisco's, Chicago's, New York's, and every other market's price.

Having the original information before anybody else, these men enjoyed especial advantages. Having first information, they made others pay tribute to them. They knew when to buy, when to sell; they gave the public as much or as little of their precious information as they

chose or as would serve their purpose. Their power of exclusive knowledge enabled them not only to *make* the world's market, but constantly to manipulate it to their profit, and to the cost of the grower and consumer alike. Though they could not repeal the law of supply and demand, they frequently bent it sadly.

Studying carefully their operations, Lubin saw that these men *made* the *Price,* and *were* the *Market.*

"I have found it," he decided. "A few men with knowledge rule the world, and the world, without knowledge is their victim. They make the producer sell as low as possible, and the consumer buy as high as possible."

THE CHICAGO BOARD OF TRADE.

THE GRAIN PIT.

FRANK M. BUNCH, PRESIDENT OF THE CHICAGO BOARD OF TRADE, THE CENTER OF THE WORLD'S SPECULATIVE WHEAT MARKET.

So Lubin decided that what those speculators did for their own profit, the world ought to do for all its people. He developed the idea of a world's clearing house of crop information, bringing all the nations to a council board on which should be charted, day by day, visible supplies and prospective yields. With no distortion, no suppression, no manipulation, the world would make its own

ONE OF THE RECEPTION ROOMS IN THE PALACE OF THE INSTITUTE.

GRAND RECEPTION HALL IN THE PALACE AT ROME. HEADQUARTERS OF THE INTERNATIONAL INSTI- ENTERPRISE OF

prices, and shake itself free from the golden grip of the information trust.

"It is good," decided Lubin. "I will go to the President, and get him to initiate a movement for an international crop reporting service." But on reflection he saw that the United States could not lead, because it was the greatest seller, and buying nations would suspect a plan to force higher prices.

No more could England lead, for England was the great buyer, and controlled the market. Producing nations would fear that these market-making Englishmen wanted to depress prices, while consuming nations would fear a plan to raise them.

At last Lubin decided to take his case to France, and set off for Paris. There, leaders of economic thought gave encouragement, but France was on the verge of its contest between church and state, and the statesmen had no time for other things.

Sadly disappointed, Lubin determined to try Rome. Of all the world's capitals, it could most appropriately underwrite his enterprise. The new Italy, fighting to establish a better civilization on ruins which everywhere testified to the failure of an older, would understand. He would show that the old order, founded in selfishness and greed, had passed, because it had been found wanting. The new order, if it would endure, must be grounded in fraternity, brotherhood and co-operation.

"If I could only get to the King," he thought, "and have the Power of the Tongues upon me!"

In Rome, Lubin met Professor Pentaleoni, of the Chair of Political Economy in one of the universities. The fates seemed determined to make our Jewish immigrant at last the servant rather than the jester. Professor Pentaleoni granted a long interview. Lubin was received in a room in one corner of which sat a simply, almost roughly clad man. He was not presented, and took no part in the discussion.

That was one of Lubin's good days. The power of the tongues was upon him.

GIVEN BY KING VICTOR EMMANUEL AS PERMANENT TUTE OF AGRICULTURE, FOUNDED BY THE DAVID LUBIN.

ENTRANCE AND CENTRAL FACADE, PALACE OF THE INSTITUTE.

Pentaleoni heard his plan, and presented every conceivable weakness. Lubin smashed all objections; explained every uncertainty; brushed aside every quibble. Lubin won Pentaleoni, and forgot the insignificant person in the corner.

But the mysterious stranger was none other than Guglielmo Ferrero, greatest of contemporary historians, the most popular and the most profound latter-day student of ancient and mediaeval Italy, as Lubin learned when, a few days later, Dr. Ferrero published a dramatic story of that interview. The man who had studied most carefully that greatest problem of Imperial Rome—the problem of finding and bringing daily bread for the city which styled herself mistress of the world—not only gave indorsement to Lubin, but reinforced his argument with a richness of analogy and historic citations that set all Italy talking.

The shop-keeper of Sacramento became the lion of the hour. The government sent for him. Signor Tittoni, afterward Premier, and Signor Luzzatti, minister of finance, interested themselves. Providentially, Luzzatti was a Jew. Lubin was told that the government was ready to initiate an International Conference, to work out the plan. But only the King could invite other sovereigns to send delegates. Mr. Lubin must get King Victor Emmanuel's indorsement! And in due time an interview was arranged with that monarch. It marked a great event in Lubin's life.

There may be less conventional people in this world than David Lubin; but not many. Panic seized him when he was told that he must wear a silk hat, and accommodate himself to court etiquette. He was duly drilled in the tremendously important art of carrying his silk hat hanging over his thumb; in the ceremony of entering the royal presence; learned that under no circumstances must he turn his back on the King; and was assured that to sit in the royal presence would be an international scandal. His audience was to last five minutes; and to overstay it would surely cause an ejectment whose horrors he was permitted to imagine.

"Cinque minute; cinque minute"; they kept impressing upon him; and when he

KING VICTOR EMMANUEL OF ITALY, WHO GAVE THE INCOME FROM TWO OF HIS PRIVATE ESTATES TO FURTHER LUBIN'S PLAN TO SOLVE THE GREAT WHEAT PROBLEM.

could do his act perfectly, and the great occasion came, the last thing he saw as he was ushered down a line of liveried lackeys to the threshold of the audience chamber, was that row of uplifted hands with outspread fingers, in mute but awesome reminder of, "cinque minute, cinque minute!"

Another minute, and the king entered. Lubin, scared almost to death, looked up into the grave and kindly face of Victor Emmanuel, forgot in that instant all his etiquette, thrust the silk hat under a table, and strode forward with outstretched hand.

"How do you do, your Majesty? My name is David Lubin, from Sacramento, California, and I have business that is very important to you."

A smile crossed the face of the king, and there was a twinkle in his eye as he replied, in excellent English:

"I am glad to see you, Mr. Lubin. Sit down and tell me about this business."

But Lubin did not sit down. Instead, the shopkeeper from the States led the king to a window, and waved his hand to call attention to the panorama of the Imperial City.

"Your Majesty," he said, "these ruins tell of that which has passed because it was not good. Will you have your new Italy, your new Rome, to be great and enduring, or will you have your newer civilization crumble in dust upon these older monuments? Would you be king of an Italy of liberty and brotherhood?"

The King motioned his attendants, and they withdrew in despair at this invasion from Sacramento, California. "Cinque minute, cinque minute!" they muttered hopelessly.

I cannot tell much about that interview between the King and David Lubin. But "cinque minute" lengthened to two hours, and at the end of the long interview the lackeys were horrified by the spectacle that burst upon them.

For the door opened, and out walked Victor Emmanuel and David Lubin. The King held Mr. Lubin's hand in both of his. They were both talking, now; and when the boy from the Ghetto and the desert and the store by the stilted side-

walk stopped for an instant the overpowered attendants heard the King say:

"All right, Mr. Lubin; I shall not try again to tell you how glad I am that you came. It is going to be just as you wish. Your plan shall be carried out, to the extent even of my private fortune."

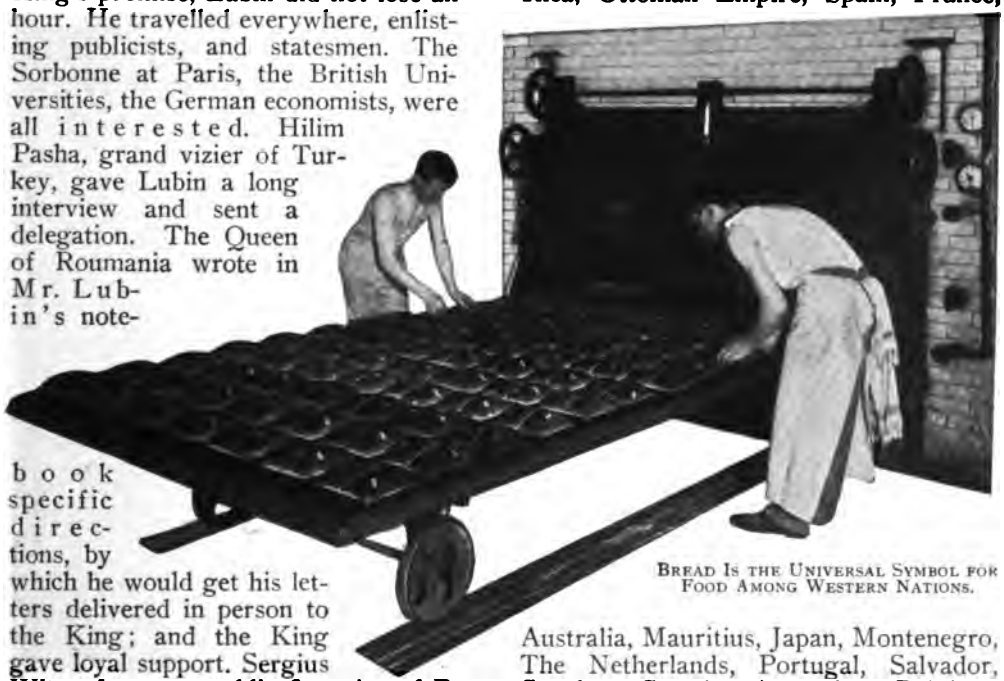
Thus the battle was won. The King consulted his ministers, and presently sent forth a proclamation to the nations. It invited attention to the desirability of international co-operation to obtain official statistics on agricultural production, and stated that "the matter had been called to the attention of His Majesty by Mr. David Lubin of Sacramento, California." Would not the powers send delegates to Rome to consider the project?

So Italy issued invitations for the first International Conference, held at Rome in 1905. Some thirty nations were represented, for from the day he received the King's promise, Lubin did not lose an hour. He travelled everywhere, enlisting publicists, and statesmen. The Sorbonne at Paris, the British Universities, the German economists, were all interested. Hilim Pasha, grand vizier of Turkey, gave Lubin a long interview and sent a delegation. The Queen of Roumania wrote in Mr. Lubin's note-book specific directions, by which he would get his letters delivered in person to the King; and the King gave loyal support. Sergius Witte, foremost public financier of Russia, entered the list of Lubin's supporters, and Russia committed itself to the project. President Roosevelt sent as delegates from the United States, Honorable Henry White, then ambassador at Rome; Albert F. Woods, of the Bureau of Plant Industry; David Lubin, and W. F. Hill, Head of the Pennsylvania State Grange.

That conference of 1905 is now history. With his native eloquence, profound conviction and unflagging energy, David Lubin dominated it. But the big men who composed it, once the big idea was before them, needed only to be shown how it could be carried into effect.

The conference declared in favor of an international service of agricultural information, and drew up a protocol. The foreign office of Italy was authorized to initiate the pact, and Victor Emmanuel set aside two of his personal estates as a trust, the income to be devoted to the Institute. It is now about $60,000 a year, and will be much greater in future.

The treaty for the establishment and co-operative maintenance of the International Institute of Agriculture was duly ratified by the following countries: Germany, Hungary, Bulgaria, Costa Rica, Ottoman Empire, Spain, France, Australia, Mauritius, Japan, Montenegro, The Netherlands, Portugal, Salvador, Sweden, Canada, Argentine, Belgium, Chili, Cuba, Egypt, United States, Tunis, British India, Greece, Luxembourg, Nicaragua, Peru, Roumania, San Marino, Switzerland, Austria, Brazil, China, Denmark, Ecuador, Ethiopia, Great Britain and Ireland, New Zealand, Italian Erythria and Somali, Mexico, Norway, Persia,



BREAD IS THE UNIVERSAL SYMBOL FOR FOOD AMONG WESTERN NATIONS.

Russia, Servia, and Uruguay—a remarkable diversity of nations.

Victor Emmanuel built the "Palais de l'Instut International d'Agriculture," in the beautiful Villa Umberto I, formerly the Villa Borghese, and dedicated it to the Institute.

The first meeting of the International Institute of Agriculture opened May 29, 1908, in Rome. Sessions continued for several months, and a detailed organization was perfected. Each adhering nation was asked to perfect as soon as possible a system of crop and weather reporting and estimating, so that the most complete and accurate information possible should be secured. This information should be unified and standardized in such manner that, when all the countries had forwarded their data to the experts of the International Institute, they would have a more complete and reliable showing of world conditions than private enterprise or speculative zeal could possibly secure. From this, the Institute's specialists would make up conclusions that would guide the world's markets accurately and surely. There would be no favorites. Everybody should have the information at once. The speculative element should be reduced to the minimum. Every nation should place the information before its people—before the smallest producer and the most insignificant consumer, as well as the richest dealer or most powerful market manipulator—all at the same time.

Each of the fifty nations maintains a representation at the International Institute throughout the year. These serve as a clearing house for the exchange not

DELEGATES OF FORTY-FOUR NATIONS AT THE GENERAL ASSEMBLY OF AGRICULTURE IN SESSION AT

only of weather and crop information, but of all kinds of agricultural knowledge. Recently a peculiar blight attacked the orange groves of Spain. The Spanish representative at the Institute asked Mr. Lubin—who has from the beginning been the permanent representative of the United States—for a description of the California process of orange-tree fumigation. It was secured and forwarded instantly, and saved the Spanish orange growers. That is one instance in scores that might be cited, of the tremendously valuable service that has been rendered through this exchange of the world's best agricultural knowledge.

Americans cannot readily appreciate the possibilities of such a work, unless they understand that no other country has a weather service or a crop-reporting organization comparable to our own. But under the inspiration of Lubin and the lead of the International Institute, the rest are being induced to effect such organizations. The Crop Information Trust with headquarters at Liverpool is beginning to realize that its monopoly is not so powerful as it once was. The world knows more about its food supplies, its crop outlook, its prospective yields, than it ever did before. It judges more accurately what prices ought to be; it is less at the mercy of speculative cliques or interests. It cannot so easily be fooled by inaccurate or misleading reports.

OF THE INTERNATIONAL INSTITUTE
ROME, MAY, 1911.

THESE WERE THE AMERICAN DELEGATES IN MAY, 1911.
From left to right: David Lubin, Wm. C. Hill, Lloyd C. Griscom, Wm. M. Stewart, C. C. Clark.

Of course, this work is by no means perfected as yet. Countries have their crops reported by different systems; some use calendar year periods in making up totals; others use differing fiscal periods that do not synchronize and that make comparisons difficult. But gradually better and better order is being brought out of chaos. The tremendous possibilities of the Institute are at last realized, and governments are backing it with enthusiasm. Nowhere is there so little appreciation of its possibilities, apparently, as in the United States; and that chiefly because so very little publicity has thus far been given to its work.

The bulletin service of the Institute includes not only information about crop conditions and prospects, but more recently has been expanding to include many matters of social and economic importance. For instance, the Institute has been making a study of the Raiffeissen system of people's agricultural and trades banks, in Germany. These insti-

WHEAT IS THE STAFF OF LIFE IN THE OCCIDENT. WHERE IT IS HARVESTED BY SCIENTIFIC METHODS.

tutions have been the means of establishing independent credit and banking facilities among the peasant cultivators of Germany and, to less extent, other European countries. Their work has been of the greatest value; last year they did nearly six billions of dollars of business for the poorer people in Germany alone. The system is needed in many other countries; even in the United States it is being investigated with great care by the Grange, the Farmers Union, and some of the state administrations, with a view to its adaptation to our necessities.

This people's banking system is the subject of a very valuable report that the International Institute is just issuing, to be put out in five languages, and distributed to all the adhering countries.

These are random examples of the work done by the institute that David Lubin founded. It is yet in its infancy; but already it gives promise of developing into a World's Department of Agriculture. It is already assured of success as a check on speculative extremes, and a means of bringing together, in a common fund, the very best crop and agricultural knowledge that the governments can secure.

David Lubin, honored all over the world as the founder of the Institute, has given up other business, and devotes most of his time to this monumental work. He lives chiefly in Rome; a little, smooth-faced, stoop-shouldered, earnest man with a very big voice and the intensity of a prophet of old Israel. He talks of the Institute, its work and its future, with an eloquence that never fails to carry his point. He is the sort of man who would be set down as a fanatic if he were not right; as a visionary, if his plans did not succeed; as utterly impractical and unbusinesslike, if he were not intensely practical and a distinguished business success. His great business in California goes along without him; his partner, moved by much of the same inspiration that has carried Lubin so far, sympathizes, and his family is devoted to his projects. He is a man to whom the nations will be erecting memorials—a generation or two after he is dead.

TWO HUNDRED CITIES IN REVOLT

By

HENRY M. HYDE

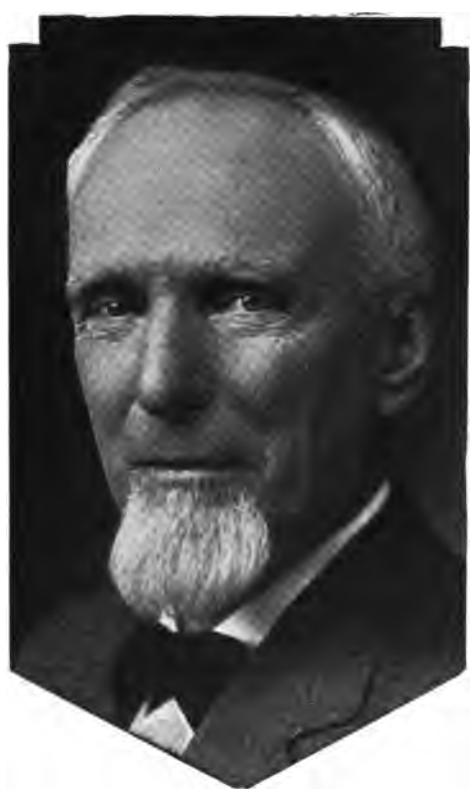
THE most remarkable political fact of the last decade is the rapidity with which American cities are changing their form of government.

Twelve years ago Galveston, Texas, was practically wiped out by a tidal wave. When the waters receded they left the island covered with wreckage, slime and debt. But that tidal wave wiped out more than a single city! It swept away —though no one dreamed of it at the time—the city boss and the corrupt politician from hundreds of American municipalities.

Galveston was left broken and bankrupt. The work of reconstruction — the great problem of making the city safe— called for the best efforts of the strongest and ablest men. It was no job for gang politicians, such as had ruled and despoiled the city — in alliance with big business— during the old days. In their extremity the people of the city called upon the legislature and the Governor of the state to help them. They asked that the old form of city government be suspended and that a commission of five strong men be appointed, who should have absolute charge of every department of the city government.

So—with no idea of forever ending the rule of the Boss—did Commission Government come into existence.

The governor's commission took hold of their great task like men. For two years they labored mightily, while the old politicians sulked and growled and starved. Then there came a chance for the politicians to take the whole question into the courts. The courts decided that because a majority of the commission was appointed by the Governor, the whole body and its work was unconstitutional. Whereupon the people rose in their wrath and elected the same five commissioners by a vote that buried the gangsters deeper than the tidal wave.



GEORGE ALEXANDER, MAYOR OF LOS ANGELES. Los Angeles has not Commission government. The initiative, referendum and recall are in force.

So the original "commission" became a purely popular and elective body, though the name—now a complete misnomer —has stuck. It was five years before the Galveston antitoxin for the city boss disease began to take. Houston, watching with jealous eyes the rebirth and rapid growth of its sister city, was the first to follow the Galveston example. And on

T. C. THOMPSON. MAYOR OF CHATTANOOGA, TENN.

F. W. DONNELLY, MAYOR OF TRENTON, N. J.

the heels of Houston, with rapid stride, came the revolution.

Between January 1, 1906, and February 1, 1912, no less than 186 American cities scattered through 33 states, adopted the commission form of government.

A glance at the table of Commission Cities will show that they vary in population from mere hamlets of one or two thousand to big towns of 150,000, like Oakland, California. In all there are about 4,000,000 city dwellers now living under the commission form of government.

More than two hundred other municipalities are now seriously considering the adoption of the commission, and the "Galveston idea," while not adopted in its entirety, has materially affected the form of government in such great cities as Boston and Pittsburg.

The essential features of the Galveston or commission form of city administration are these:

1. All power and responsibility must be centered in and confined to a small council or commission, usually of five members, who, by themselves or through their own appointees, pass all city ordinances, enforce them, and administer all city affairs. This commission is the city government.

2. The members of the commission must be elected from the city at large and not as representing any ward or district.

3. The members of the commission must be the only elective officers of the city (with the possible exception of an auditor or school board) and must have the power to appoint all the subordinate administrative officials.

4. The commission must have the power to remove at will any or all of the officials it has appointed. In this way only can the commission, itself, be held directly responsible for results by the people of the city.

The initiative, referendum and recall, while they form part of the charter in most commission-governed cities, are not an essential part of the plan.

Official List of Commission Plan Cities—Corrected to February 1, 1912

Cities added since October are in italics

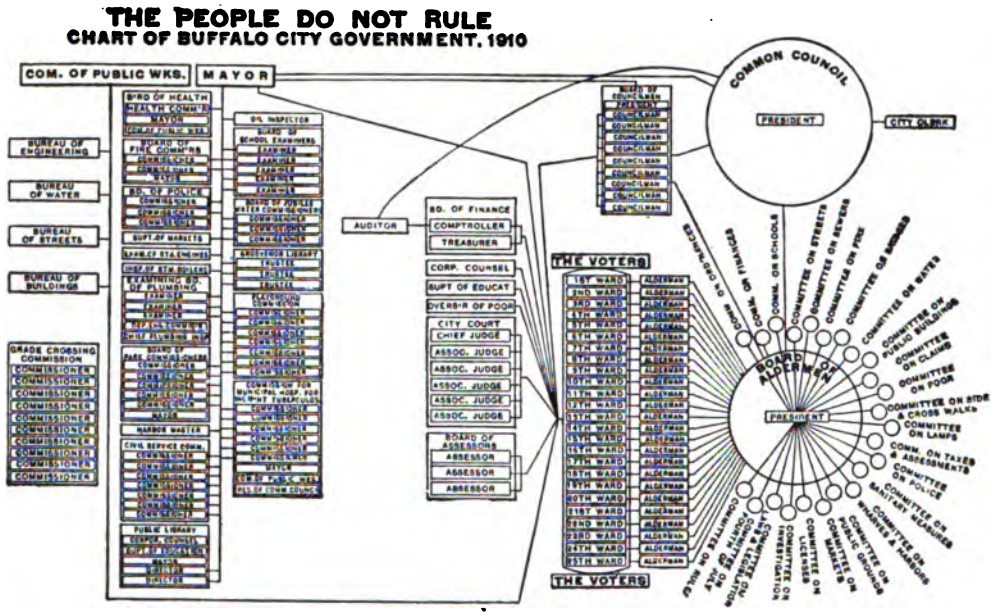
	Pop.
ALABAMA	
Birmingham	132,685
Cordova	1,747
Hartselle	1,374
Huntsville	7,611
Mobile	51,521
Montgomery	38,136
Talladego	5,854
Tuscaloosa	8,407
CALIFORNIA	
Berkeley	40,434
Modesto	7,258
Monterey	4,923
Oakland	150,174
Sacramento	44,696
San Diego	39,578
San Luis Obispo	5,157
Santa Cruz	11,146
Stockton	23,256
Vallejo	11,340
COLORADO	
Colorado Springs	29,178
Grand Junction	7,754
GEORGIA	
Cartersville	4,067
IDAHO	
Lewiston	6,043
ILLINOIS	
Carbondale	5,411
Clinton	5,165
Decatur	31,140
Dixon	7,216
Elgin	25,976
Forest Park	6,594
Hamilton	1,627
Hillsboro	3,424
Jacksonville	15,326
Kewanee	9,307
Moline	24,199
Ottawa	11,121
Pekin	9,897
Rochelle	2,732
Rock Island	24,335
Springfield	51,617
Spring Valley	7,035
Waukegan	16,069
IOWA	
Burlington	34,324
Cedar Rapids	33,811
Des Moines	86,368
Fort Dodge	15,543
Keokuk	14,008
Marshalltown	13,374
Sioux City	47,828
KANSAS	
Abilene	4,118
Anthony	2,669
Caldwell	2,205
Chanute	9,272
Cherryvale	4,304
Coffeyville	12,687
Council Grove	2,545
Dodge City	3,214
Emporia	9,058
Eureka	2,333
Girard	2,446
Hutchinson	16,364
Independence	10,480
Iola	9,032
Kansas City	82,331
Kingman	
Leavenworth	19,363
Manhattan	5,722
Marion	1,841
Neodesha	2,872
Newton	7,862
Parsons	12,463
Pittsburg	14,755
Pratt	3,302
Topeka	43,684
Wellington	7,034
Wichita	52,450
KENTUCKY	
Lexington	34,099
Newport	30,309
LOUISIANA	
Shreveport	28,015
MAINE	
Gardiner	5,311
MARYLAND	
Cumberland	21,839
MASSACHUSETTS	
Gloucester	24,398
Haverhill	44,115
Lawrence	85,892
Lowell	106,294
Lynn	89,336
Taunton	34,259
MICHIGAN	
Fremont	
Harbor Beach	1,556
Pontiac	14,532
Port Huron	18,863
Wyandotte	8,287
MISSISSIPPI	
Clarksdale	4,079
Gulfport	6,386
Hattiesburg	11,733
Laurel	8,465
MINNESOTA	
Faribault	19,001
Mankato	10,365
MONTANA	
Missoula	12,869
NEBRASKA	
Beatrice	9,356
Nebraska City	
Omaha	124,069
NEW JERSEY	
Ocean City	1,950
Passaic	54,773
Ridgewood	5,416
Trenton	96,815
NEW MEXICO	
Roswell	6,172
NORTH CAROLINA	
Greensboro	15,895
High Point	9,529
Wilmington	25,748
NORTH DAKOTA	
Bismarck	5,443
Mandan	3,873
Minot	6,188
OKLAHOMA	
Ardmore	8,618
Bartlesville	6,181
Duncan	2,477
El Reno	7,872
Enid	13,799
Guthrie	11,654
Holdenville	
Lawton	7,788
MacAlester	12,954
Miami	2,907
Muskogee	25,278
Oklahoma City	64,205
Purcell	2,740
Sapulpa	8,283
Tulsa	18,182
Wagoner	4,018
OREGON	
Baker	6,680
SOUTH CAROLINA	
Columbia	26,311
SOUTH DAKOTA	
Aberdeen	10,753
Canton	2,103
Chamberlain	1,275
Dell Rapids	1,367
Huron	5,791
Lead	8,392
Pierre	3,656
Rapid City	3,854
Sioux Falls	14,094
Vermillion	2,187
Yankton	3,787
TENNESSEE	
Chattanooga	44,604
Knoxville	36,346
Memphis	131,105
TEXAS	
Aransas Pass	1,197
Austin	29,860
Beaumont	20,640
Corpus Christi	8,222
Dallas	92,104
Denison	15,632
Fort Worth	73,302
Galveston	36,981
Greenville	8,850
Houston	78,800
Kennedy	1,147
Marble Falls	1,061
Marshall	11,452
Nixon	
Palestine	10,297
Port Arthur	7,663
Port Lavaca	1,699
Robstown	
UTAH	
Salt Lake City	92,777
Logan	7,522
Murray	4,057
Ogden	25,580
Provo	8,929
WASHINGTON	
Centralia	7,311
Chehalis	
Hoquiam	8,171
North Yakima	14,082
Spokane	104,402
Tacoma	83,743
Walla Walla	19,364
WEST VIRGINIA	
Bluefield	11,188
Huntington	31,161
Parkersburg	17,842
WISCONSIN	
Appleton	16,773
Eau Claire	18,310
Janesville	13,894
Menominee	
Oshkosh	33,062
Rice Lake	
Superior	40,384
WYOMING	
Sheridan	8,408

Commission government has not been yet on trial for a long enough time to justify a statement that it will solve all the problems of municipal government. Its merits, however, are many and very plain.

Under the old system of electing a mayor and many other city officials, including one or two aldermen from each ward, the ballot includes so many names that it is practically impossible for the voter to get accurate information about all or any considerable number of them. There are only eight or ten names on the ballot in a commission election and the chance of a bad man slipping through is thus greatly lessened.

Under the old form of city government there are so many officials and the power and responsibility is so divided among them that it is practically impossible to fix the blame for bad results. With a commission the responsibility is centered in one man, who cannot dodge or evade either blame or credit.

In the old form so many men and de-



COMPARE THIS COMPLICATED AND UNWIELDY SYSTEM OF ADMINISTRATION WITH THAT ON THE OPPOSITE PAGE.

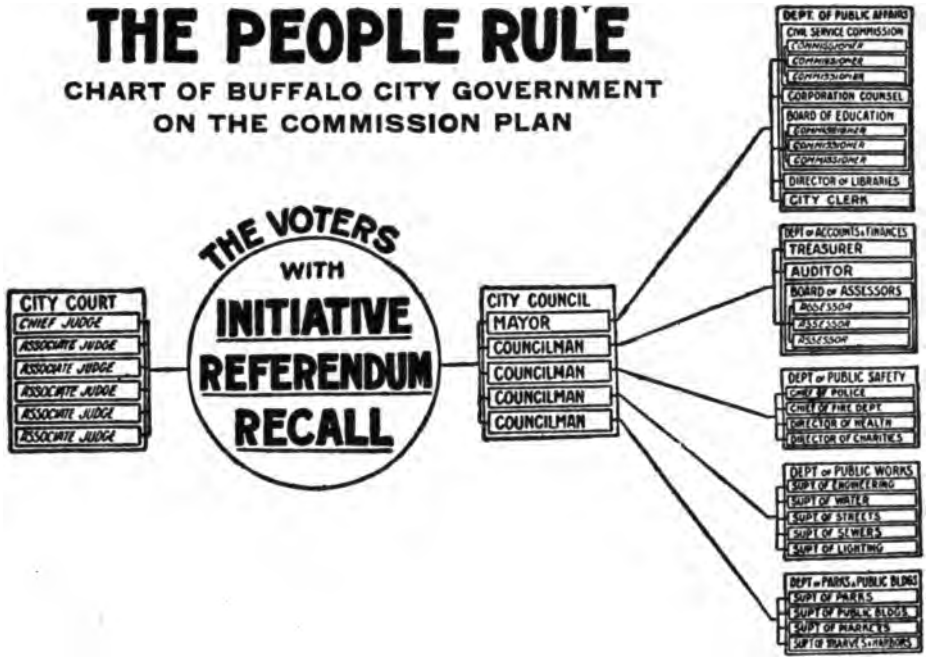
From this division and confusion of authority and responsibility many evils result.

partments must be consulted that the administration of city business is greatly delayed. Under a commission, business is greatly simplified and expedited. In ten minutes action can be taken which, under the old regime, might have been postponed for as many weeks or months.

When it comes to setting down the specific results of commission government in the cities where it is being tried, the first thing to be noted is that in not a single instance has grafting or corruption been charged — let alone proved— against any commissioner. Returns from a few scattered cities follow:

E. H. Crump, Mayor of Memphis, Tenn.

Houston, Tex. — Commission plan in effect January 1, 1906. Credit of the city, which had been worth about eighty cents on the dollar, was restored to par. Tax rate has been reduced from $2.00 to $1.70, while assessments are said to be proportionately lower. The old debt of



CITIZENS ON NOV. 2, 1909, VOTED THAT THE CITY OF BUFFALO ASK THE STATE LEGISLATURE TO ENACT A CHARTER FOR BUFFALO ON THE COMMISSION PLAN

UNDER THE COMMISSION PLAN, THERE IS EFFICIENT SIMPLICITY OF ORGANIZATION AND THE POWER REMAINS IN THE HANDS OF THE PEOPLE.

$400,000 was quickly wiped out. In five years, seventy miles of streets have been repaved, the cost being defrayed out of general revenue. A great auditorium and its site have been paid for from the same source. Schools have been redeemed from politics. Gambling and illicit liquor selling have been stopped. The price of gas has been forced down from $1.50 to $1.15 per thousand.

Dallas, Tex.—Commission plan in effect 1907. In first two years the commission wiped out a deficiency of $200,000 and established a credit balance.

Des Moines, Ia.—Commission plan in effect in 1907. In its first year the commission saved $184,000 in running expenses, as compared with the previous year under the old government. It made better bargains for the city in electric light charges, obtained interest on city deposits for the first time, cleaned streets and alleys better (the alleys had formerly not been cleaned at all) and wiped out the "red light district," the effect of which has since been shown in reduced crime.

Cedar Rapids, Ia.—Commission plan in effect January 1, 1908. The city has been put on a cash basis, pays its bills every Wednesday morning, taking a two per cent. discount for cash. Bonded indebtedness reduced by $93,000 net. The city's net inventory has been increased from $453,168.43 January 1, 1908, to $878,806.24 January 1, 1911.

Leavenworth, Kan.—Commission plan in effect in 1908. The commission has reduced the bonded indebtedness by $112,950, while the tax rate has remained stationary. Kansas is a prohibition state, but Leavenworth has always defied the law and allowed the saloons to exist, subject to periodical fines which brought in $80,000 a year. The commission closed the saloons and disposed of this illegal revenue without disturbing the tax rate. Over $200,000 was spent in special improvements the first year as against an average of $25,000 in previous years. In

THE 185 COMMISSION-GOVERNED CITIES IN THE UNITED STATES.
Each dot marks a city weary of the old order of clumsy, inefficient administration.

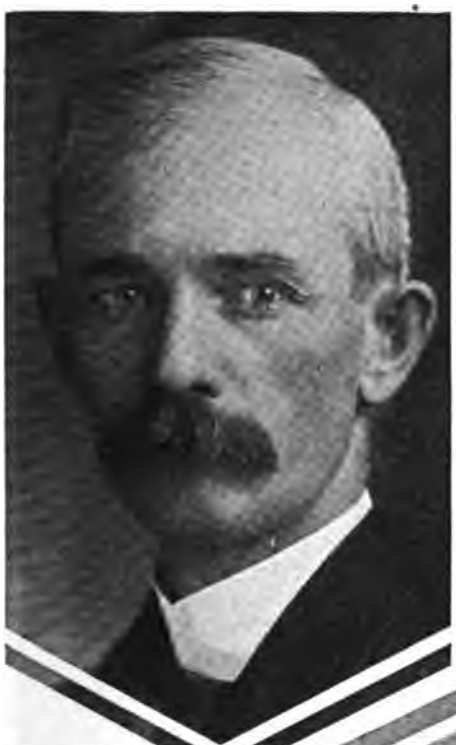
the first two years under the new system six miles of street were paved as against twelve miles in the preceding twenty-five years.

Haverhill, Mass.—Commission plan in effect in 1909. The first year's report under the new plan showed a saving of $97,900 in running expenses. When the commission took hold the financial status of the city was very bad. It had reached both its debt limit and tax rate limit and was steadily falling behind in its payments. Appeals were being made to the legislature for an extension of the tax rate limit, but this extension has now become unnecessary. In addition the city has voted no license, the revenue from the saloons being no longer needed. Party lines in Haverhill, which was formerly a Republican city, have been completely broken. The commission consists of two Democrats, two Republicans and a Socialist.

Gloucester, Mass.—Commission plan in effect 1909. The first year's report showed all bills paid and a reduction in the city debt of $18,000. It is claimed that the roads and streets have been better kept at $6,000 less annual expense.

Keokuk, Ia.—Commission plan in effect 1909. When the plan went into effect the city treasury was empty and there was a floating debt of 20 per cent. of the annual revenue of the city. After six months commission government, the city began operating on a cash basis and the bonded indebtedness decreased by $39,000. More than double the amount of street improvements made in the corresponding six months of the preceding year was made, while for less than one-half of the results accomplished in the street department this year for $11,500 the city paid out last year the sum of $14,000.

Kansas City, Kan.—Commission plan in effect 1910. When the new regime commenced it was found that a deficit of $40,000 in the annual expenses was imminent. By energy in collecting licenses, dog taxes, taxes on street cars and telephone poles $16,000 more was collected in nine months than in the previous year. Cutting out superfluous city employees and economizing reduced the expenses sufficiently to enable the Commissioner of Finance to promise that the city within a few months will be free of its indebtedness.



JAMES R. HANNA, MAYOR OF DES MOINES, IOWA.

GEORGE N. SEGER, MAYOR OF PASSAIC, N. J.

W. J. HINDLEY, MAYOR OF SPOKANE, WASHINGTON.

Sioux Falls, S. D. — Commission plan adopted 1909. In this city of 15,000 population a debt of $100,000 has been paid off in two years. The floating debt is being reduced and the sinking fund accumulated.

Topeka, Kan.— Commission plan in effect 1910. Party politics have been completely divorced from the city administration. For the first time a local railway company has been compelled to make street repairs when relaying its tracks. The city formerly attended to this. The Finance Commissioner being unable to dispose of a large issue of bonds to brokers to his satisfaction, sold the entire issue to residents of the city by private correspondence, making the best sale which has ever been made in this city.

Burlington, Ia.— Plan in effect April 4, 1910. Population, 34,324. In first three months city was placed on a cash basis, present debt refunded in serial bonds at 4½ per cent. interest instead of 6 per cent. Taxation was equalized and more work accomplished at less expense. Mayor and councilmen devote their entire time to city affairs.

All bills discounted and interest received on daily balances in bank. About $20,000 was saved the first year.

Columbia, S. C.—Plan in operation May 11, 1910. Population, 26,311. For current administrative and departmental expenses since January 1st, the previous administration had expended $169,468.09, or a rate per annum of $468,536.00. During the remainder of the year the commissioners spent $167,435.04 for the same purposes, without curtailing work in any way, or at a rate per annum of $262,300.00. The old council spent $13,289.00 while repairing 39 city blocks; the new council thoroughly repaired 166 blocks for $17,426.00.

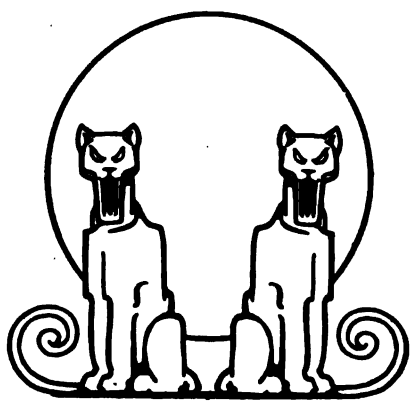
Birmingham, Ala.—Plan in effect April, 1911. In the first month under the new plan the city borrowed $500,000 at the lowest rate in its history. The commission cut down the annual running expenses by $75,000 in the first week.

In this as in all other reforms, there is danger that enthusiasts will confuse the means with the end.

The commission plan is admirable only so far as it proves the best instrument through which honest and efficient city government can be obtained. There is nothing about it sacred—nothing which is not and should not be subject to amendment. And there have already been proposed some most interesting variations from the plan. One of them is that adopted by the city at Staunton, Virginia. Its citizens decided that they would like to try commission government, but they presently discovered that under the constitution of the state, commission government in its ordinary form could not be had. Whereupon they promptly adapted the plan to the conditions. They elected a small city council from the city at large and that council employed, at a good salary, an experienced civil engineer and executive to act as general manager of the city. Lockport, New York, has asked that it be given power to make a similar experiment. It proposes the election of a small commission, the members of which shall serve in exactly the same capacity as the directors of a business corporation, employing as a chief executive a Municipal General Manager. In this way it is expected that in cities which cannot afford to pay for the full-time services of five important men, their expert advice can be secured and the power and responsibility can be concentrated in a single man under their direction.

As the German cities are administered by professional Burgomasters, who may be called from a small city to a larger, as their experience and ability grows, so under this Staunton and Lockport plan a new profession of Municipal General Managers might be developed in this country.

Most important of all is the fact that the people who live in American cities have, at last, developed a sense of civic or community pride and responsibility. And the short ballot and the so-called commission form of government are apparently the best tools that have so far been found for giving effect to their new aspirations.



MADE GOOD USE OF "WASTED" YEARS

WHEN several big doctors with reputations so widespread there isn't room to hold them on this continent, told Professor Irving Fisher of Yale that he had about three years longer to live, naturally he didn't like it. Professor Fisher is a big man himself, one of the country's foremost political economists. However, he cast all scholarships behind him, and announced in colloquial English as vigorous as the doctors' own, "Gentlemen, I'll fool you."

THE DOCTORS GAVE HIM THREE YEARS TO LIVE: HE GAVE HIMSELF THREE YEARS IN WHICH TO RECOVER HIS HEALTH.

SLEEPING OUT DOORS IS AN EXCELLENT HEALTH INVESTMENT.

"Here's for three wasted years," he mourned as he turned his back on the green of college life and started for the mild climate of the Pacific. But those three years proved the very backbone of his life and work, for he came back literally a man made over—soul and body. He was so glad over his accomplishment that he wanted everyone else to know just how it was done. With this end in view he lectures frequently on "Physical Efficiency as a National Asset." His activities extend from day camps for consumptives to governmental health boards, and never for an instant does he let up or tire.

He is a living example of his own theories and manner of existence, and is one of the busiest men in New Haven. In between times he has written a governmental report which is quoted all over the country on "National Vitality: Its Waste and Conservation."

His ideas are as big as the man himself, which is saying much.

GOT BLOOD FROM A TURNIP.

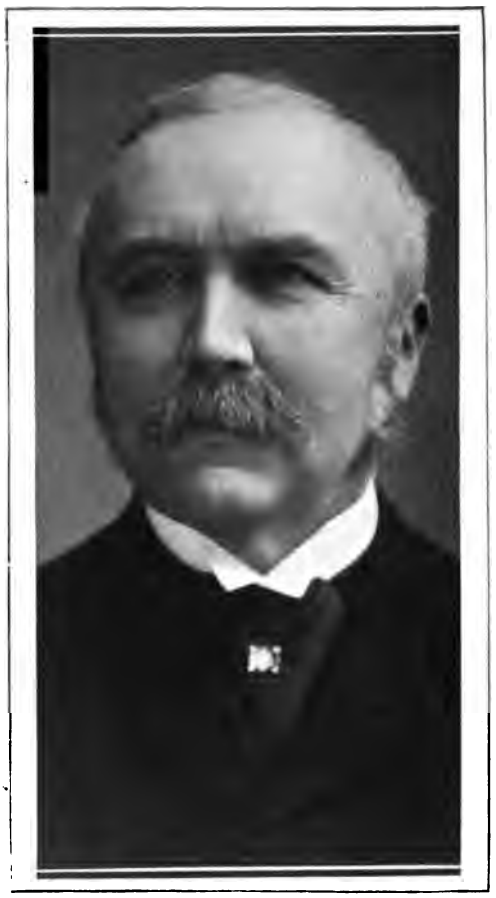
FIFTEEN years ago this man was trying to squeeze a living out of some river-wash land along the Feather River in Butte County, Cal.

He needed water, and like his neighbors he dug a well to get it. They had dug wells, too, but in the process the dirt and cobblestones taken from the hole represented to them dirt and cobblestones—nothing more. They believed there's no blood in a turnip. Wendell P. Hammon, the man we are talking about, saw a lot of glistening particles mixed in with the sand. He had been seeking gold through the circuitous route of raising golden fruit. Why not extract the gold direct from the soil? But was it possible? The golden grains were too fine and too scattered to be obtained by any of the existing methods of placer mining. Hadn't the Chinese tried it, and who could live cheaper than a Chinaman?

But Hammon said: "I'll build a successful dredge."

He did, and his gold dredges have enabled California to lead the states in gold production, the yearly output from their operations totaling $7,550,000. Having plowed up the surface of his dredged-over land to a depth of 50 feet, Hammon saw another way of squeezing blood out of the turnip. He said: "Let's crush those hard cobblestones into macadam and thus furnish cheap ballast and road material for the railroad and the farmer." Now, three huge plants are working night and day turning out 6,000 tons of crushed rock each day. Next, why not plant these lands to fruits and eucalyptus from Australia? It was done, and this also proved, like the other things that Mr. Hammon had undertaken, a big success.

PREMIER ASQUITH, THE NOMINAL LEADER OF THE LIBERAL PARTY.
Lloyd-George, Chancellor of the Exchequer, lost for him the splendid majority bequeathed by Campbell-Bannerman.



THE LATE SIR HENRY CAMPBELL-BANNERMAN.
A Liberal who succeeded Balfour as Premier. "He had a greater majority at his back than even the great Gladstone had ever received."

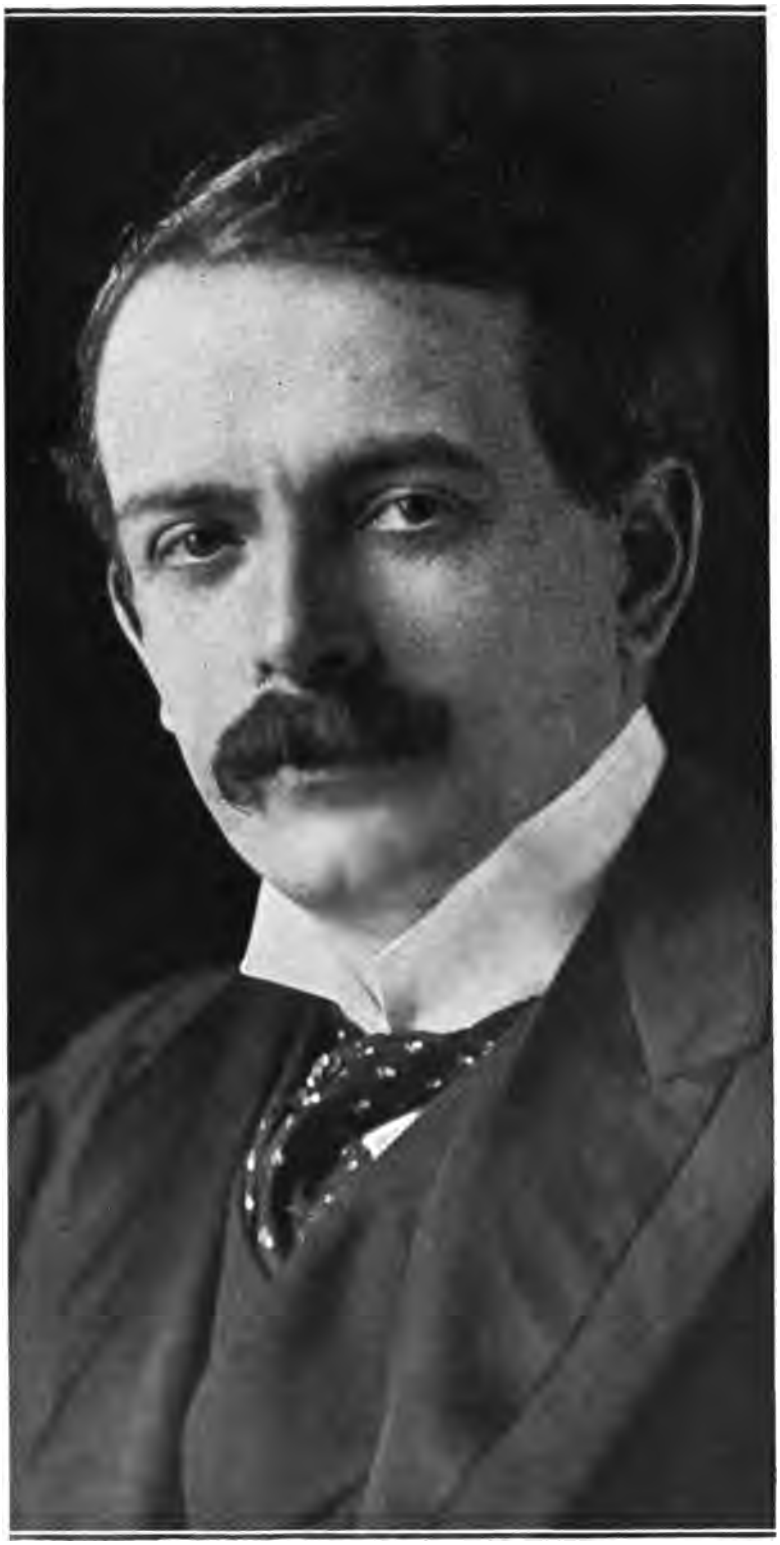
WHEN WELSH AND IRISH RULE

By

ROBERT BARR

THE present political situation in Great Britain is so astounding, so unprecedented, that if a writer attempts dispassionately to portray it, he should be out of the turmoil in London, and view the position with the impartial gaze of an alien. I happen to be well equipped for such a task, for I am writing these words in an unfashionable Italian town, the click of the typewriter punctuating the steady roar of the Mediterranean. I am quite out of reach of any book of statistics, therefore, thank goodness, I can give you no figures, yet I shall endeavor to be as accurate as the multiplication table.

A short distance along the coast westward, a few miles nearer America than I am a man from the same island to which I belong, but of a different nation-



DAVID LLOYD-GEORGE, CHANCELLOR OF THE EXCHEQUER, THE REAL HEAD OF THE LIBERAL PARTY.

His apparently radical measures to insure workingmen against sickness and unemployment have stirred England as has nothing else in decades.

ality, is at this moment playing golf. I sometimes see his smiling face as he rushes past in a motor car, and I always think of another trip he took along the same road somewhat more than a year ago, on the most desperate man hunt that any automobilist ever undertook.

This man is more powerful than King George of England. He is more powerful than the Right Honorable Mr. Asquith, Premier of Great Britain. He is more powerful than the House of Commons, the Mother of Parliaments, as it is called, and he is naturally much more powerful than the House of Lords, recently hamstrung by himself, and this potent, temporary neighbor of mine is David Lloyd-George, Chancellor of the British Exchequer.

A hasty person might jump at the conclusion that if what I have written is true, David is the most influential man in the British Empire, but a reflective reader, well up on Bible history, which David loves to quote when he makes his exciting speeches at Whitefield's Tabernacle, will remember that in the olden days the David of that time had his Jonathan. They were friends and equal, but our David's Jonathan is as much more potent than Lloyd-George, as Lloyd-George is more potent than King George. This Jonathan is John Redmond, leader of the Irish Nationalists. The first governor of England, therefore, is an Irishman; the second is a Welshman; the third, nominal leader of the party, is member for a Scotch constituency. So "here's a state of things," as Sir W. S. Gilbert remarked, a state of things, indeed, to be equalled only in the regions of his own topsy-turvey drama. The Liberal Party is in the minority, yet the Liberal Party is in power, while the Irish Nationalists rule. Of the political groups in the House of Commons today, the Conservative Party stands first in point of numbers; the Liberal Party, even with the extreme Radicals added, comes second, while the Irish Nationalists come a long way behind for the third place, yet actual power in a country supposed to be governed by a majority, rests with the smallest group; the nominal power is held by the largest minority section, while the Conservative Party, which possesses a plurality of votes in the House of Commons and in the country, is helpless as a smoker lost in the desert, with a good cigar and no matches. England, the most conservative of countries, is in the hands of the most radical of governments, and Lloyd-George, by kind permission of Mr. Redmond, is king. Well might that bewildered country sing the Jacobite song prevalent when the first George, also a foreigner, came to the throne:

"Wha th' Deevil hav' we gotten fur a King?
A wee bit German Lairdie,
An' they hav' found this fearsome thing
Digging in his Kail-yairdie."

England, that depends for its existence on manufacturing, on shipping and on business generally, has, for Chancellor of the Exchequer, a man who a few years ago was a no-account cross-roads lawyer in Wales; a man who knows nothing of finance, of shipping, of manufacturing; one distrusted by every business man in the country; who is raising taxation to a height never before known in English history; who has created more offices than any five of his predecessors, filling them with his own partisans; who has promised the working-man an immediate Paradise, and now that the working-man finds himself still upon earth, has created a state of industrial unrest that appals a thinking citizen. How came a sober-minded country to do such a thing?

She didn't do it, or perhaps it would be more correct to say she did it inadvertently. They called the South African contest the "absent-minded war," parodying Kipling. An absent-minded election gave Lloyd-George his opportunity. Previous to 1906, politics in England had come to a sort of dead centre: there was nothing doing. When President Kruger hurled his ultimatum at Great Britain, he inaugurated an unpleasantness, the seriousness of which was understood by very few persons in the latter country. The Transvaal was prepared: England is never prepared for anything. The lackadaisical Tory Government mismanaged everything to the limit. When peace was declared the Tory Government should have been thrown out for its incompetence, but it dragged on a nerveless existence. It was led by one of the

most charming, cultured men in England, Arthur James Balfour; a man of so fair and philosophical a turn of mind that he never could answer definitely the simplest question. If you asked him whether or not two and two made four, he would reply that it all depended on how you looked at it. When his energetic henchman, Joe Chamberlain, unexpectedly sprang tariff reform on the country, feeling, as he did, that the Government was going to die of anaemia, his own preference being to die fighting, nobody in all the land knew exactly where Balfour stood on the question.

Arthur James was great on tactics, and his friends tell me that on this occasion his tactics held the Tory Party together. Doubtless they did, but it held them together merely to lead them to the slaughter. The Man in the Street was tired of tactics: he thought two and two did make four, no matter how you looked at it. He was sick of inanity and dilly-dallying.

THE RIGHT HON. A. J. BALFOUR, WHO, AS PREMIER, LED HIS PARTY, THE CONSERVATIVE, TO DEFEAT.
"Of too fair and philosophical turn of mind to answer definitely the simplest question."

The Liberal Party was at that time apparently in a state of disintegration. It was headed by a man who had reached that elevation merely because of his child-like commonplaceness and general stupidity. The Liberal Party could agree on nothing; could unite on no question except hatred of the Tories, and so Sir Henry Campbell-Bannerman, a well-intentioned old Scotsman, was compromised upon, and became the titular commander of a scattered host. Asquith, Sir Edward Grey and others were against home rule, which had twice wrecked the Liberal Party; another section, equally prominent in its counsels, were in favor of the measure. Winston Churchill, a deserter from the Tories, was trusted by nobody in particular, and gave promise of being as erratic and spectacular as his father, Lord Randolph. Lloyd-George was regarded very generally as merely a demagogue with a great gift of the gab. These varying elements could not unite upon even so fair-minded and moderate a man as, for instance, John Morley, now the lord of that name. Still, they must have a leader of sorts, and so the colorless but honest old Scotsman was chosen.

Leaving aside the disintegration of the Liberals, and alos the fact that Chamberlain's unauthorized proclamation on the tariff, had momentarily at least, split the Conservative Party into two sections, let us consider the action of the leaders on the eve of the election, remembering that the English people are at heart free from subtilty. As a nation they like a plain answer to a plain question. To their own cost, as war after war has shown, they despise tactics, butting their stupid heads against stone walls, charging with brute force direct at the object, and taking it, if possible, at the point of the bayonet, rather than

encouraging thought in the general's tent, and strategy that will save men's lives. This sort of thing has gone on for centuries, as for instance, when General Braddock, despite Washington's warning, led his men to annihilation, and when Captain Dalzell, with a whoop-hurrah, fell into the trap at Bloody Run, Detroit, losing life and following to the Indians, and so on, down to the time when General Buller threw away his cannon and his victory in South Africa, and again when the finest regiment of Scottish Highlanders was cut to pieces through stupid leadership during the Boer War. The English want yes or no, and they have small patience with the devious arts of diplomacy.

So here we come to the bluff old Scotsman, Campbell-Bannerman, confronted by the philosophical younger Scotsman, Balfour. The lead was in Balfour's hands, and two methods of dealing were open to him, one being to dissolve Parliament, and put the matter squarely to the test; the other to resign, and craftily place the burden on his opponent. Balfour very cleverly chose the latter alternative. It was now up to Campbell-Bannerman. He also had two courses open to him; first, to accept responsibility and name his cabinet; second to refuse, and thus force Balfour to dissolve. A tactician would not have hesitated. He would have refused, considering the condition of the Liberal Party, for that party was in such a state of internicine warfare that any cabinet selected would be like a stick of dynamite thrown among this incohesive mass. The Liberal press at once realized the trap Balfour had placed for his opponent, and with unanimous voice they shouted: "Don't fall into it! He's got you defeated before the battle begins."

JOHN REDMOND, WHO CONTROLS THE HOUSE OF COMMONS THROUGH THE IRISH VOTE.
For his support the Liberals have pledged home rule for Ireland.

"Oh, bless you, no," replied Campbell-Bannerman, jauntily, "it's the easiest thing in the world to form a cabinet. After all, the people must decide. I'll name the members within two days," and despite the clamor of his own party journals, Sir Henry hailed a passing hansom, jumped into it, and drove democratically to the residence of the King, paying his shilling fare, and a sixpence for the tip, just as any ordinary citizen might have done, instead of going to Buckingham Palace with his five thousand dollar motor car, as would have been the case with Balfour.

"First-rate!" cried England. "This is the sort of man we want; who knows his own mind, and doesn't give a hoot for journalistic clamor." That very evening the majority of the cabinet was announced: a splendid selection, most of them men in whom all England had confidence, men like John Morley, Asquith, Haldane and Sir Edward Grey; all friends of Gladstone, and men trusted by him and by the people.

For the first time in years a thrill of

confidence ran through the Liberal Party. Two offices were still vacant, but next day the bold Sir Henry filled them, and their occupants were David Lloyd-George and Winston Churchill. These names evoked no enthusiasm, yet one of those men has now charge of England's finances, and the other, like Sir Joseph Porter, controls the King's Navee, probably the two most important offices in the gift of a British Government. The *debacle* which followed for the Tory Party was the most decisive thing ever done by Britain. Sir Henry Campbell-Bannerman was Premier of Great Britain with a larger majority at his back than even the great Gladstone had ever received. When Sir Henry died, he left that majority intact to Mr. Asquith, the new Premier. Winston Churchill had acquitted himself remarkably well, and Lloyd-George in the minor office he held as head of the Board of Trade, had very completely won the confidence of England by his moderate, business-like common sense administration of that office. A readjustment of things followed.

WINSTON SPENCER CHURCHILL, FIRST LORD OF THE ADMIRALTY, A VIGOROUS AND EFFICIENT SUPPORTER OF THE LIBERAL ADMINISTRATION.

In the re-shuffle Lloyd-George was made Chancellor of the Exchequer. England was not alarmed, but it opened its eyes when his first Budget was produced. Opposition to it arose all over the country. Capital, always timid, took fright, and a fierce discussion ensued.

"We'll accept this," said the House of Lords, "if the people really want it, but we must be assured on that point."

"All right," said Jack the Giant-killer, "I'll go to the people if I am forced to, but when I come back, I'll settle your hash, I'll promise you that. You'll never again throw out a Budget produced by the House of Commons."

The Lords accepted his challenge, and kicked the Budget downstairs, and here we have a curious anomaly: the aristocrats demanding a poll of the people, while the chief of the plebeians fought against such an appeal. The result would have appalled any man less brave than Lloyd-George. If the Tories had possessed a capable leader, the Liberals would have been routed. The splendid majority achieved by Campbell-Bannerman had dissolved like a morning mist. Liberals and Conservatives came from the poll neck and neck, and the compact Irish party held the balance of power. All the Liberals were dismayed except Lloyd-George. Terms were made with John Redmond, and the moment feared by Gladstone had at last arrived. Gladstone had thought that no English statesman would accept office dependent on the Irish vote, but he counted without the only Liberal who had ever openly defied Gladstone in the House of Commons.

Lloyd-George braced up the quaking Asquith, and cheered the despondent hearts of his following, breathing ven-

geance against the House of Lords, and determined to carry out his threat. He encouraged them by saying the House of Lords was unpopular with the country, and on this question the third election was fought. Asquith announced that unless he got a suitable majority, leaving him free and independent, he would not take office. He not only failed to get such a majority, but the Tories as a party elected the most members, and the Liberals as a party were in a minority. The moment the elections were over, Asquith bolted. No one knew where he had gone, but as all English ministers, when they are tired out, make for the Riviera, Lloyd-George started in pursuit, missing his shot by a hundred miles.

The Welshman arrived at Genoa, and learned he was on the wrong trail. Then came the celebrated motor ride along the coast; a breathless journey, for time was of the utmost value. He must see the Premier before the latter could make his intention public. He ran down the discouraged Asquith at Cannes.

Of all men on earth that Asquith did not want to see at that moment, Lloyd-George was the person. Asquith, with the most magnificent majority a Premier ever possessed, bequeathed to him by the departed Campbell-Bannerman, had been dragged down by the impetuous Lloyd-George, until he now stood the head of a minority party. Of course, a compact, ready-made majority was at his disposal, if he made terms with the Irish Nationalists, but the price of that majority was home rule, and Asquith had been all his life an anti-home ruler. Besides, his word was now pledged to the English electorate that he would not accept office in the humiliating circumstances.

Of course, I was not present at this momentous meeting, which one man had tried to avoid, and the other, with his amazing energy, had chased across Europe to accomplish, therefore what I state now is heresay, from those supposed to be "in the know."

"I cannot stultify myself," said Asquith. "I cannot be the English Premier to force a home rule bill through the House of Commons."

"No need for that," answered Lloyd-George. "Take things in their order. You talk of pledges. You are pledged to abolish the veto of the House of Lords."

Asquith admitted that to be the case.

"Very well, if you give up now, it will be the Tory Party that will deal with the Lords, to their own satisfaction. You stand by your guns till the Parliament bill is passed. I'll see that you have a majority. Obtain from the King a promise that the necessary number of peers will be created to overcome the Tory majority in the Lords."

Asquith demurred at this attempted coercion of the King, but Lloyd-George, not Asquith, knew the Lords.

"You will never need to go so far as to use the King's prerogative," he said, confidently. "The Lords will back down," which, sure enough, they did. "When the Parliament bill is on the statute book you will have accomplished the task you set out to do, and to show you have no ill-feeling against their lordships, you can resign and join that honorable body. I'll take the premiership, and carry home rule through."

So the chances are that the next Premier of England will be the Right Honorable David Lloyd-George, the most remarkable man in Great Britain. No sooner had he nullified the Lords than he set out to show the House of Commons how little it really amounted to. The closure, popularly known as the guillotine, a deadly implement not possessed even by the enlightened legislature of Canada, invented by the Tories, is now a potent weapon in the hands of Lloyd-George, and with it, he forced through the Insurance bill. The House of Commons has been silenced as effectively as the House of Lords.

Can he hold on? I do not think so. He has made the mistake that nearly all Liberals make when power is in their hands, of getting too far ahead of slow-moving popular opinion. Prince Rupert was the best general that Charles I possessed, but he ruined the cause of the King by his headlong impetuosity, chasing the enemy too far afield, gaining victory always in front of him, but leaving defeat in his rear.

The historian Froude said: "There is no such despot as a Liberal when raised to authority."

The career of Lloyd-George proves the wisdom of this saying.

ESKIMOS OF VICTORIA LAND, WHO HAD NEVER BEFORE SEEN A WHITE MAN.
They dress in caribou, wolf, fox, and bird skins.

NEW RACE IN THE FROZEN NORTH

By

LILLIAN E. ZEH

A NEW race of people of the North, who have never before seen a white man, are now introduced for the first time to the civilization of the temperate zone by the American Museum of Natural History, New York.

For the first time in their lives the new peoples have faced the camera, and it may be for the last, as far as these individuals are concerned who are seen through negatives developed on board the schooner *Teddy Bear* far North in the regions where stretch endless wastes of snow and ice.

The expedition is in charge of Dr. R. M. Anderson and Mr. V. Stefansson, both experienced explorers, who have studied the habits of strange tribes and peoples in latitudes where chill winds blow and ice packs on the wind-swept tides.

The explorers came in contact with several tribes in the neighborhood of Cape Bexley, and in the middle of Dolphin and Union Straits they met a charming and courteous race. One of their guides started the greetings wrong by approaching the party with his hands at his side and was nearly knifed for so doing. The Eskimos in that region extend their hands in front of them as a peace signal and carrying one hand at the side is interpreted as a gesture of defiance. They proved to be the A-ku-li-a-kat-tag-mi-uts.

Neither they nor any of their forefathers as far as they knew had ever seen a white man, an Indian or an Eskimo from the west. They believed by tradition, however, that the Indians were very bad; that the Eskimos of the west were none too estimable, and that the white men, the Kablunat, as they called them, were good and could be trusted.

ESKIMOS "SKIPPING THE ROPE."

THE PLANT AT THE MAN'S LEFT WAS GROWN IN THE USUAL WAY. THE PLANT AT HIS RIGHT UNDER ELECTRIC INFLUENCE.

ELECTRICITY MAKES FLOWERS BLOOM

By

EDWARD I. PRATT

GREENHOUSE flowers, forced by growing in an electric field, yield double; their quality is greatly improved, their stamina increased, disease is checked, at a cost for current for three months' experiment on two eighty-foot benches, of eight dollars. This in a few words is what has been accomplished by a Chicago greenhouse specialist, Richard Gloede.

"Electric chrysanthemums," so the greenhouse man called them—sturdy-stemmed, with great round yellow blossoms, that fairly beamed on you, clustered gracefully high above a big crock on the packing room floor.

The stems were so long and the tops so big that visitors to the florists could lift them up without stooping. And yet these chrysanthemums were average samples of a great long bench of culls. At least they were culls before he could give them the name of "electric chrysanthemums."

This Chicago florist had read of the experiments of Sir Oliver Lodge and other scientists in the growing of field plants with the aid of electricity. He reasoned that, as the greenhouse man has the same difficulties as the field crop culturist, and many additional ones besides, due to temperature, crowding, disease, etc., the same idea could well be applied to his benches.

His first complete experiment under practical commercial conditions was with two benches of chrysanthemums, made up as follows: from one big lot of shoots, half of the plants—all the best ones—were set out in one bed, while the balance, culls and inferior stock, were set out in another parallel bed. Both of these received the same amount of light and heat and were prepared exactly alike except for the electrical equipment.

THE PROPAGATING BED IN THE HOT HOUSE. SHOWING WIRING. CROSS-ARMS AND INSULATION.

The maturing was hastened by their growing in this electrical field obtained by high-tension currents. The conductors consist of a single heavy galvanized ground wire embedded in the center of the dirt, parallel to the sides of the bed.

About three and a half feet above the bench are six parallel wires, hung lengthwise from the insulators on wooden cross-arms. Cross-wires every twelve inches form a network covering the bed. From these wires, light chains hang at intervals, reaching down half way to the soil.

The overhead and ground wires are connected to a transformer which steps up the voltage to about 250,000 volts. This apparatus is connected to the local light and power company's lines, whose power is 110 volts, 60 cycles. The current from the line first passes a frequency changer which raises the frequency to about 600 cycles. The plants, being directly under the influence of the electrical field, are acted upon by the high tension current.

The two benches of chrysanthemums were, in all other respects, started and cared for in exactly the same way as many other beds in the greenhouses supplying the Chicago markets.

The bed of culls which had the electric equipment was the first to mature, blossom, and be cut.

The power is turned on for at least six hours a day during the growing period. The expense of the current for three months is given as eight dollars, although in the perfecting of the equipment, it is believed a greater economy will be possible.

Early in the experiment it was found that the electrically treated bed was soon rid of all fungus growth, that the stalks were unusually strong and heavy. Ordinarily, with greenhouse flowers of this type, having long stems and grown close together in the bed to save space, the stems are weak and breakage resulting in harvesting and marketing is quite an expense item.

The "electric chrysanthemums" showed a rapid growth from the start. The tops had to be "pinched back," as greenhouse men say, several times to prevent too high a growth. Another feature of the electrically treated flowers was that the maturing was as vigorous and rapid on the shady side of the bed as with those plants most exposed to sunlight.

In the propagating benches, also, the results were startling. In an ordinary planting, often but one-third of the seed germinates, constant watering and attention being needed. In these same benches wired, the seeds germinated uniformly, and with no fungus growth, less watering and loss.

This first harvest showed twice the average number of blossoms. None of these plants in this greenhouse are "forced" in the popular sense of the term, as the temperature is kept down to 55 Fahrenheit, the idea being that much sturdier and hardier plants result.

As soon as possible the wiring will be placed over all benches and the plan is

to experiment with each flower and plant as it comes in season. Already tests have been made with carnations and roses where the yield was increased to nearly four times the usual crop for the same number of plants and bench space.

A truck garden grown in connection with the greenhouse work was also electrically equipped with important results. In spite of a dry season, melons, tomatoes, radishes, corn and other farm produce showed remarkable growth. For instance, musk melons planted June eighth ripened in less than nine weeks, grew evenly and all were ready to pick within six or seven days. These melons were planted from seed in a plot twenty feet square from which 362 good melons were picked. This garden patch altogether was fifty feet square and was electrically equipped similar to the greenhouses, the wires being suspended from posts eight feet from the ground. Radishes as well as tomatoes and corn not only grew to a uniformly large size but were of delicious flavor.

TRUCK GARDEN, SHOWING POSTS AND WIRING, WHERE ELECTRICITY INCREASED THE YIELD.

Experiments in England and elsewhere along these lines prove wonderful possibilities in agricultural electricity. Not only is the growing period invariably shortened and the quality improved, but the yield is increased. In specific instances the increase in electrically forced strawberries was 36 per cent, beets 30 per cent, tomatoes 20 per cent, cucumbers 17 per cent.

While, as indicated above, varied experiments have been successfully made with large field crops, such as corn, wheat and barley, the increased expense in some cases has made further experimenting necessary, before the practicability of applying electric current to the stimulating of plant growth can be finally passed upon. The results so far, however, indicate a splendid future for this combined science. The Chicago man who has worked out the greenhouse tests not only asserts he has bigger yield, better quality, decreased loss, with a shorter period for growing, but he says he can accomplish these things well within the profit limit.

Man's Work

Go to your work and be strong,
halting not in your ways,
Baulking the goal half-won for an
instant dole of praise;
Stand to your work and be wise,
certain of sword and pen,
Who are neither children nor gods,
but men in a world of men.

—*Rudyard Kipling*

FORTUNES WASTED IN A PAYING INDUSTRY

By

GUY E. MITCHELL

COKE, as the housewife well knows, makes an excellent fuel for producing a quick fire in summer time.

This coke, the sort used in the home, is what probably most of us are familiar with; but it is a very unimportant product as compared with the 30,000,000 to 40,000,000 tons of coke which are produced annually in the great coke fields of Pennsylvania, West Virginia, Virginia, Alabama, Illinois, Colorado, and a half dozen other states. It is this latter, metallurgical coke which has played such an important part in the country's industrial development. The great bulk of the coke in the United States is made solely for metal reduction, for the blast furnace, the smelter, the foundry. It has taken the place of charcoal and anthracite coal as a melter of ore and metal, a gasless fuel being required for such work.

LUMP OF COKE. MADE FROM SUPPOSEDLY NON-COKING COAL.
Experiment made by the United States Geological Survey.

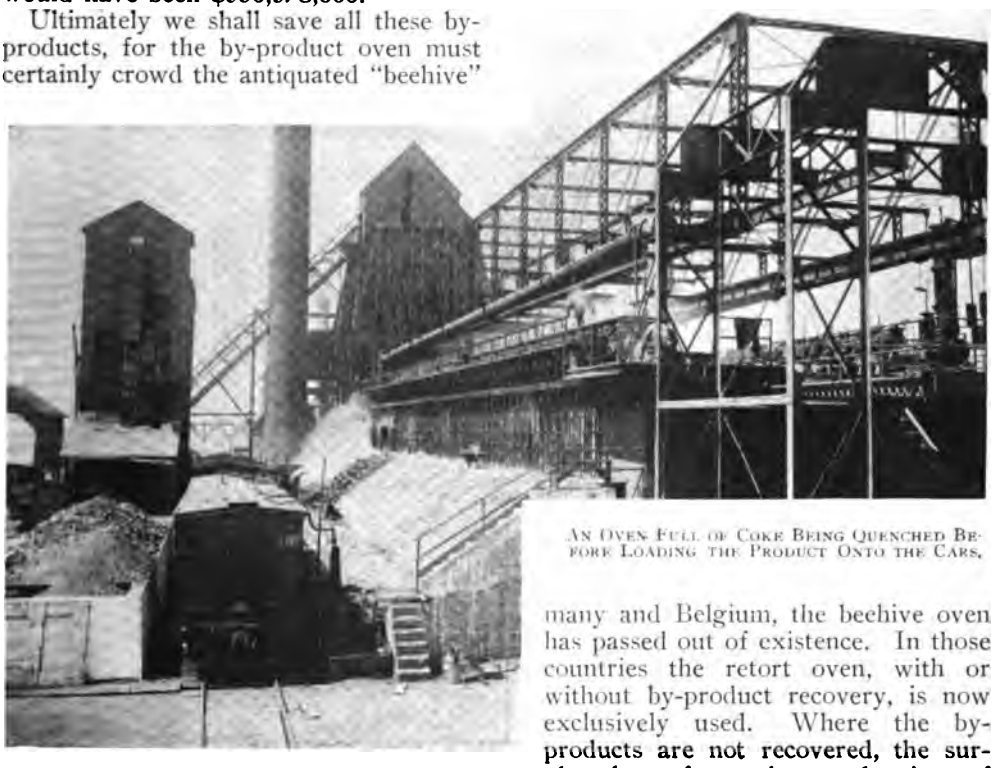
The traveler passing through the great coke states is at once struck with the long lines of coke ovens, pouring out their dense volumes of smoke and fumes into the atmosphere, and at night lighting up the sky with their red glare. More than 500,000,000 tons of this metallurgical coke have been produced in the United States since 1880, and the rapid increase in output has been an index to the activity and prosperity of the development of the baser metal industry. Yet this represents at the same time a tremendous waste. The very picturesqueness of the coking districts with their thousands of blazing coke ovens denotes an almost unexampled squandering of a natural resource of great value.

In 1910 the United States produced 41,708,810 tons of coke and in making 33,229,253 tons of this at least $35,000,000 was lost, according to the United States Geological Survey. How can this be when the entire coke industry was reported as prosperous? The answer is that 82 per cent of the coke was in "beehive" ovens, so constructed that all the by-products of the coke—gases, tar, ammonia, and other valuable materials—were burnt off into the atmos-

A LONG BANK OF BEEHIVE COKE OVENS.
The cloud of smoke and fumes represents a waste of valuable by-products.

phere. In making the remaining 18 per cent, however, in by-product coke ovens, these by-products were saved to the value of $8,479,557. In the past four years, as estimated by E. W. Parker, the coal statistician of the Survey, with all the coke which has been produced made in by-product ovens, the value of the by-products saved would have amounted to $135,000,000. Had this saving process been applied to the entire coke production since 1880, the gain to the country would have been $550,578,000.

Ultimately we shall save all these by-products, for the by-product oven must certainly crowd the antiquated "beehive"



AN OVEN FULL OF COKE BEING QUENCHED BEFORE LOADING THE PRODUCT ONTO THE CARS.

oven out of existence. In Europe the by-product oven has completely superseded the wasteful beehive type, but the investment represented by the more than 90,000 beehive ovens in the United States is enormous, amounting to $40,000,000, or more, and there is, moreover, some prejudice against by-product coke, early ironmasters having become accustomed to the beehive product. Mr. Parker states, however, that the quality of the coke from the by-product oven is actually better than that from the beehive, while the yield is fully 15 per cent greater. By-product-coke production is gaining steadily every year over beehive production, although the latter still has a long lead.

In making a comparison of the coke industry in this country and in Europe Mr. Parker says:

"The United States is much behind European countries in the abandonment of the wasteful beehive method of coke manufacture and still clings to this method, which may well be called antiquated. In Europe, particularly in Germany and Belgium, the beehive oven has passed out of existence. In those countries the retort oven, with or without by-product recovery, is now exclusively used. Where the by-products are not recovered, the surplus heat from the combustion of gases is used in the generation of power, and it is estimated that about 15 horse power can be obtained from each oven. Applying this average to the more than 90,000 beehive ovens in the United States, it would appear that 1,350,000 horse power is going to waste in the coke regions of the United States every day in the year. In the Connellsville and lower Connellsville districts of Pennsylvania alone the energy available from the 38,000 ovens would exert 570,000 horse power."

Not every grade but only certain grades of coal are capable of pro-

ducing really good coke—the highest grades of bituminous coal. It is therefore apparent that such coals are of great importance. In fact they are the most valuable of all coals from the standpoint of national worth, even more important than anthracite, which while the latter is the most perfect fuel because of its smokeless quality and highest percentage of carbon, is in reality a domestic luxury. But the prosperity of the metal industry depends upon the supply of coking coal. In its classification of the public coal deposits, the United States Geological Survey places high-grade coking bituminous coal at the top of the list and on a par with anthracite. The great bulk of this coal is found in the Appalachian coal fields but there are good smaller deposits in a number of the Western states. Moreover, under recent improved methods coking of coal is being carried on in the metal-mining regions of the West where formerly coke was imported from Pennsylvania. It is interesting to note that investigations of the Geological Survey and the Bureau of Mines have shown the feasibility of making good coke out of certain western coals which it was supposed were practically non-coking in character. Coke was actually made in the government fuel testing plant from a Colorado coal obtained at a point where metal reduction works had been importing all their coke from Pennsylvania at a heavy freight cost.

QUENCHING BY-PRODUCT COKE AS EJECTED FROM THE OVEN AT WHITE HEAT.

The great coking fields include fifteen or sixteen Appalachian and Middle-West states with some deposits in four or five of the regular mining states and one deposit on the Pacific Coast. Coke is also manufactured in a number of states having no coal deposits. Alaska also has excellent coking coal and this is destined some day to be an important factor in the development of her own industries as well as those of the Pacific Coast. On this subject Dr. A. H. Brooks, geologist in charge of the Alaskan work of the Geological Survey says: "The high-grade coking coal of Alaska stands without a rival as to quality in any of the coals except of the Eastern coal fields of the United States or those of inland China. We have iron deposits in Alaska and in the Coast states and the time is approaching when there will grow up a great iron industry on the Pacific Coast. When that time comes Alaskan coke will be a prime factor in steel making."

As delivered from the ovens and used in smelting it is in large pieces, but a considerable portion of the coke manufactured in the United States, aside from gas-house coke, is crushed in the same manner as anthracite coal, screened and sold for domestic consumption. It makes a very fine fuel.

THERE IS NOTHING PECULIAR IN THE APPEARANCE OF THE FOLDING BUNGALOW.

A FOLDING BUNGALOW

By

ROBERT H. MOULTON

ADAM INT-HOUT, of Chicago, is, by profession, a chemist, and the probabilities are that he can and does devise as sweet, or as ill smelling, and as marvelous concoctions as any of his predecessors, ancient or modern. But that's another story. His chief claim to fame rests upon a small wonder house, or "folding bungalow," designed and built by himself, in which he and his family live with as much ease and elegance as the average dweller in a mansion or a three-bathroom apartment.

Mr. Int-Hout's bungalow is peculiar in this respect. He simply touches a button or a lever, and presto—the partitions of his house move backward or forward, china cabinets, book cases, dining room table and other articles of furniture appear or disappear as if by magic, until the bewildered guest begins to wonder if he is "seeing things."

In this folding bungalow probably more of the essentials of fine living are compressed into a smaller space than in any other similar structure ever built It also eliminates many of the causes of friction which from time immemorial have beset married couples who keep house. All of the useless steps taken and the useless energy expended by the average housewife in preparing and clearing up after three meals a day are reduced to a minimum.

The bungalow is twenty-six feet

THE LIVING ROOM. THE GRILL AT THE LEFT HIDES THE FURNACE, WHICH IS DIRECTLY BEHIND.

square, has a living porch eight feet by ten feet in front, and a side entrance porch and porch seat. It stands in the middle of a fifty foot lot and is shaded by two immense, arching elm trees. The house is divided into living room, kitchen, bathroom, down-stairs bedroom, and a furnace closet. There is no sign of a dining room, nor can you find one indicated on the floor plans which the enthusiastic owner shows his guests. Nevertheless such a room exists and you are likely to find yourself in it when you least expect it. That's a little joke which Mr. Int-Hout delights in playing upon the unsuspecting visitor.

The easiest way to understand it is to imagine that you have been invited to dinner at the Int-Houts. After you have been welcomed, the hostess, leaving you in the living room, excuses herself to go into the kitchen. As has already been stated no housemaids upset the scheme of harmonious living that this family is working out.

Perhaps the first thing that catches your attention is the stairway next to the entrance door, and you notice the clever way in which the balustrade forms a set of book shelves running clear down to the floor. Next to this is the closet for outdoor wraps, then the opening of the small hall leading to the bedroom where you took your things off, and next there is an attractive grill which extends from floor to ceiling just in the middle of the long wall space that forms the back part of the living room.

This grill, while very unusual and artistic, seems to serve no particular purpose, and while you are wondering what it is for your eye travels along to some water colors hanging on the next six feet of wall space. This partition and a swinging door, which leads to the kitchen, seem to complete all that there is to be seen along the back wall. But just then Mrs. Int-Hout appears and hooks the kitchen door back—and immediately you begin to rub your eyes.

Heavens, is the wall really moving? Your hostess stands there calmly with her hand on the door casement, seeming barely to touch it, and yet the whole piece of wall is turning round into the kitchen. You know this because the pictures are

A CUPBOARD IS USED IN THE KITCHEN WHERE A TABLE USUALLY STANDS.

going into the kitchen as fast as they can while with equal celerity a small hanging china cabinet comes into view on what was the kitchen side of the partition. Nor is this all, for along with the china cabinet comes a massive dining room table, in all its splendor of china and glass and snowy napery, and tempting viands. The table appears to be fast to the wall until Mrs. Int-Hout gives it a touch with her hand, whereupon it takes its position exactly in the centre of that half of the living room.

Think of that you busy housewives! A half mile at least of needless walking avoided by setting the table in the kitchen, where everything is close at hand, and then moving it by a touch right into the presence of the hungry and expectant guest. When the meal is near its end and dessert is mentioned you naturally expect the hostess to go into the kitchen after it. Instead, she simply reaches out toward the china cabinet, and there on an open shelf beneath it reposes the last course of the meal. This shelf also serves to receive the plates and other dishes when they are removed.

But perhaps the best part of it all is that one can sit at the table and talk as long as he likes without worrying about getting the table cleared off quickly for fear it will look untidy. Or if the door bell rings and other visitors appear, the table can be sent out simply by pushing it over to the partition and starting it. The wall does the rest, and the table is cleared with all the dishes right beside the sink, ready to be washed. Mr. Int-Hout is now building an automatic dishwasher which he declares will cut in half the time and energy formerly demanded for this work.

There are many things about this home which are time and labor savers from a man's viewpoint as well as a woman's. The most important of these is the furnace, which is located in a closet in the

THE DINING TABLE, ALREADY SET, IN PROCESS OF COMING IN FROM THE KITCHEN.

center of the room, the front wall being formed by the grill already spoken of. A school furnace, protected by a drum, is set into the closet space, the drum being pierced along the bottom by cold air holes which extend to a height of fourteen inches. As it was necessary that the furnace should send heat in every direction the side partitions to the closet were cut off above and below at the same height from the cold air holes.

One of the worst features of caring for the furnace, the carrying of coal, has been eliminated by another clever arrangement on the part of the owner. There is a two-foot space back of the furnace which runs between the kitchen and the bathroom. Here are the gas meter, water meter, medicine chest for the bathroom, and a chute which is built to answer the purpose of a stationary coal closet. It holds two tons and has the outside window just high enough so that the coal may be thrown into it directly from the delivery wagon. The slope adjusts the gravity so exactly that the coal always falls to the door of the chute, which is directly opposite the door of the furnace. All you have to do is to turn around and take out a shovelful as you would from a coal box.

The kitchen has a stationary laundry tub of porcelain, the top of which forms the drip board of the sink. In the back wall is a kitchen cabinet, with drawers and swinging doors in the lower part and shelves with glass doors in the upper part. As this cabinet is built into the back wall it would curtail the light ordinarily. This is avoided by glassing both the front and the back, an arrangement which not only lets the light through but also cuts down the heat, as it is only necessary to open one of the small outside panes to make the cabinet into a cooler.

There is an upper room, fifteen and a half feet square, with north and south glass doors opening on sleeping porches, thus making it cool and totally unlike the ordinary attic room.

This folding bungalow cost about $2,000 to build, and it was completed in six weeks, the outside wall being of stucco construction set on a foundation of concrete.

A Fine Symmetrical Avocado Tree at Pueblito, Mexico.
A single fruit of this tree will make a meal for a man.

The Cuagualliate or Bonete Tree.
This is a coarse Mexican fruit eaten only by Indians who fry it in slices.

NEW FRUITS TO LOWER COST OF LIVING

By

CHARLTON LAWRENCE EDHOLM

THE scientific replenishing of the nation's larder by such methods as intensive cultivation, expert management of agricultural lands, reclamation of waste areas and the introduction of new foods to take the place of those which are becoming too high priced for the average man's pocket book, will help to solve the question of the increased cost of living.

Among the less known foods which may be profitably cultivated in this country are some of the sub-tropical fruits which form an important item in the bill-of-fare of our neighbors to the south, and plans have been made, and carried out to a considerable extent, to popularize these products within our borders.

If You Want the Taste of Pineapple, Raspberry and Banana All at Once. Try This.
The pineapple guava, about two-thirds its natural size.

Of greatest importance among these fruits is the avocado, commonly known as the alligator pear, which is seen once in a while on the fruit stands with

such a large price attached to each specimen that most of us who know it at all are only familiar with its external appearance, a round or pear-shaped fruit with a rough skin, varying in color from a bright green to a deep maroon.

MEXICAN AVOCADOS, AS NOURISHING AS BEEFSTEAK AND AS DELICATE IN FLAVOR AS ANY ORCHARD PRODUCT.

The avocado, which is as nourishing as beefsteak and as delicate in flavor as any orchard product, will eventually form a staple and cheap food product in the American home. This is the prediction of experts who have studied the avocado in the semi-tropical countries where it flourishes without cultivation, and they are backing up their belief by large sums of money, which is an excellent proof of their sincerity. This money is spent in operating a well-equipped experimental station in Southern California and maintaining an expert in Mexico, where the avocado grows in abundance, and it is his duty to find the choicest and hardiest trees, from which bud wood is secured and shipped to the nursery at Altadena.

The reports of this expert in Mexico, Mr. C. B. Schnidt, confirm the observations made by other students of the avocado; namely, that a family can be supported on the product of half a dozen trees, which require slight care and labor. A single fruit, weighing a little more than a pound, will make a meal for a man, as it contains from fifteen to twenty per cent of oil besides other valuable food elements. It has a firm, pulpy flesh under a heavy skin and has a nut-like flavor which is delicate and appetizing. There are various ways of serving it, the most common being to split the fruit and simply flavor to taste with salt, pepper and lemon juice, although it is often cut into small cubes and used as an ingredient in soup.

SPHERICAL AVOCADOS, AN EXCELLENT VARIETY FOR HARDINESS, AND EASILY PACKED.
This type is found as high as 6,000 feet above sea level.

In Mexico it grows without cultivation, and a little clump of trees about the hut of a peon will assure him of a substantial living for his family for a great part of the year. In the markets they are sold for a trifling sum and feature regularly in the menu of the city dweller.

They can be bought in the markets of the United States at certain seasons, but only in limited numbers and at excessive prices, about fifty cents for a medium-size fruit, so that they are beyond the means of the average householder and are regarded as a palate-tickler for the rich rather than a food supply for the masses.

Among the Mexican varieties, are some which are quite hardy, for in that country the trees have been found to flourish from the tropical lowlands clear up to the high plateaus, where frosts are encountered which would destroy the orange. Fruit is found there which is well protected by a heavier and coarser skin than the Florida avocado and has the additional advantage of a spherical shape. This is of importance in packing, as the pear-shaped or bottle-necked fruit is more difficult to transport without injury. Hence it is from these varieties which seem to have the best commercial possibilities that the bud wood is being secured, which will eventually furnish avocado orchards for countless acres in our southern and southwestern states.

Another feature of the Mexican avocado is that by selecting specimens which bear at different seasons, a crop can be harvested in every

month of the year. In fact, sets of six trees which produce in different months may now be secured, assuring the small grower of a round-the-year crop. Such is the assertion made by the foremost avocado grower of California, Mr. F. O. Popenoe of Altadena, who is conducting a nursery for semi-tropical fruits, in co-operation with the United States Department of Agriculture.

Twenty-five thousand seedling avocadoes are growing here and a large proportion of these have been budded, with practically no loss (95 per cent success), so that uniformity of fruit and regularity of bearing season can be assured.

AN AVOCADO READY TO SERVE WITH SALT, PEPPER AND LEMON JUICE.

A number of other sub-tropical fruits are growing at the experimental station and while none of them promise to be of such great food value as the avocado, yet they will make very delicious additions to our dessert fruits. Among these is the cherimoya, or custard apple, which is roughly pear shaped, green in color and full of a soft creamy pulp. This fruit should be thoroughly cooled before serving, opened at the top and eaten out with a spoon. It tastes like a sherbet when thus chilled but is of an indescribably delicate flavor.

The white sapote is another Mexican importation which will thrive in our Southwest. In fact it is so hardy and resists the frost and drought so well that it may prove a success in climates much less mild than that of California. Like the avocado it is a remarkably beautiful tree, bears generously, and the fruits are about the size of an apple, with a soft pulp of a delicious and peach-like flavor.

Then there is the pineapple guava, or Feijoa, a member of the myrtle family, which grows as a shrub or bush rather than a tree and bears a fruit about the size and shape of a hen's egg. Under the green skin of the ripe fruit is found a white and translucent pulp that may be described as combining the flavors of the pineapple, raspberry and banana. When opened, the Feijoa gives forth an aromatic odor which is exceedingly appetizing. The seeds are small, like those of the strawberry. This tree is hardy and is cultivated successfully in France, although it is a native of South America. It will flourish without irrigation, but, of course, it produces more liberally when properly cared for, and as it will stand such a low temperature as twelve degrees above zero, it should become popular over a large part of the United States. The luxuriant, silver-grey foliage of the Feijoa makes it an ornament to the grounds of any home. Mr. Parker Earle, a well known horticulturist, formerly president of the American Pomological Society, writes concerning substitutes for our present foods:

"We cannot help wondering, as we look ahead for a hundred years, how people will live—what they will eat—when there are four hundred millions to be fed out of the land that now supports one hundred millions. With this great density of population, will there be room for producing much animal food in that time?

"An acre of land can produce, let us say, one quarter of a ton of beef, or other animal food, per year. It can produce one ton, or possibly two tons, of food in wheat, or corn, or rice. It can produce five, ten or possibly twenty tons of an incomplete food ration in the form of apples, or grapes or bananas. There may be from one to two tons or more of very rich food in the form of nuts—notably pecans—from one acre of land. But with avocados there would seem to be a possible yield of food of very high nutritive value, in tonnage equal to apples with their low nutritive value." Mr. Earle goes on to state that if men can produce many tons of food of best value from an acre of land in trees that can only yield a fraction of a ton in the form of animal food, it is pretty certain that they are going to plant trees.

DESTRUCTIVE WOOD-BORER CONQUERED AT LAST

By

CHARLES E. EDWARDS

THE teredo, that industrious borer which causes the destruction of more lumber every year than the annual cut of the State of Washington, has finally met its match, for after experimenting for years with casings of metal and cement, with preservatives such as tar and creosote and with poisons injected into the wooden piles that are subject to attack, the inventive wit of man has finally hit upon the most efficient and inexpensive agent for destroying the teredo—electricity.

The electric current has been tried in the past upon the wood thus infested, but that method proved ineffectual for the reason that the vitreous shell which encases the teredo is a perfect insulation, so that after all the expense and difficulty of sending a powerful current through the piling, the little pest worked on undisturbed.

Recently, however, a new application of the electric current to this problem was tried out in Seattle and proved an immediate success. It was passed not through the wood but through the salt water about the piling, and its action upon the salt contained in sea water was to liberate chlorine gas in volume sufficient to kill every teredo in the vicinity, no matter how deeply it had burrowed into the heart of the timber. The action of the chlorine gas upon the teredo is not only to destroy its life but to coagulate its body. The eggs are also acted upon by the gas with fatal result.

C. P. TATRO OF SEATTLE. With Professor Delius he has devised a scheme to conquer the teredo, or wood-borer.

The apparatus devised for this purpose by the Seattle men who originated the system, Prof. George Delius and Mr. C. P. Tatro, consists of a barge equipped as a power plant and a number of electrodes, the latter being suspended in the water under the dock or pier to be treated. After the wiring is properly connected, a current of low voltage and high amperage is turned on, and maintained for about an hour. Of course this treatment must be used at regular intervals, but the price at which it is possible to operate the system at a profit is very low, in fact the inventors estimate that even with the addition of this fixed charge for wharf maintenance there will be a great saving to the owners.

They figure it out in this way: The average cost of a creosoted pile is $28.00 while a similar pile with the bark on and not creosoted costs only $4.90, leaving the difference saved $23.10. Now the interest on this amount at 7 per cent is $1.61, while the minimum charge for treatment per annum of the pile is only $1.50, so that the electrolytic system for killing the teredo costs less than the interest on the money saved in the first place. In addition to this economy there is also the advantage of having a more permanent structure, as even

AFTER A WOODEN PILE HAS BEEN EATEN BY TEREDOS.
It resembles a mammoth elongated sponge of exceedingly porous quality.

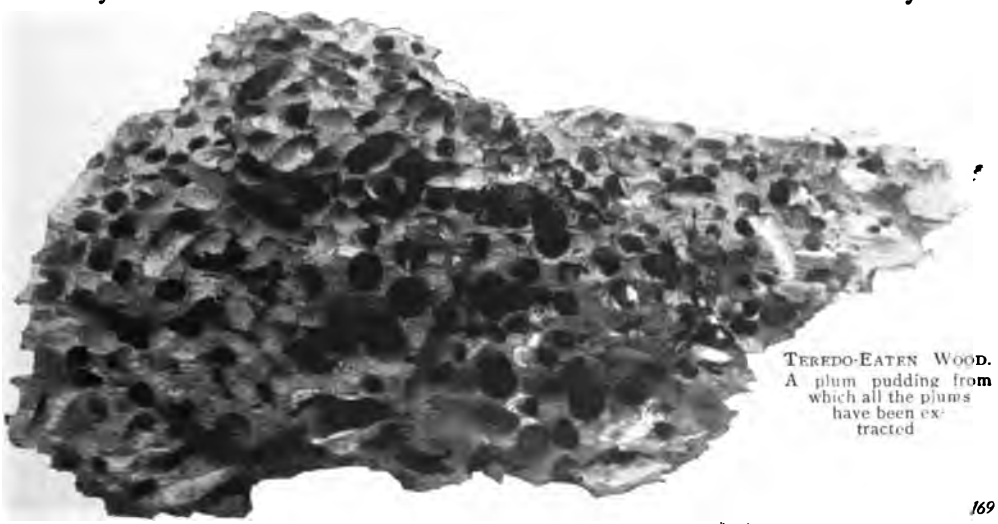
the creosoted pile is not immune from attack by the teredo for more than a few years, while the new method should prolong its usefulness indefinitely. It is estimated that such treatment once a month will keep the young teredos from entering the pile to any depth, so that if applied to new piling there would be practically no deterioration, as salt water is a preventive of decay. Even the piles which are badly affected by the teredos can be preserved from further ravages by this method, as the long worm-like body of the creature has its posterior end at the surface of the wood where it is readily affected by the chlorine gas, even though its head is boring far into the timber.

PROF. GEORGE DELIUS.

During a test made in December, 1910, some piles were subjected to the electrolytic treatment and after twenty-four hours were taken out of the water and split open. Every teredo in the wood was found to be dead and the filament-like body had been coagulated by the poisonous gas until it had the consistency of a soft poached egg.

The hulls of ships can be cleaned from barnacles by the same method, which involves considerably less expense than the primitive process of scraping them off.

It is a very remarkable circumstance that this tiny crea-



TEREDO-EATEN WOOD.
A plum pudding from which all the plums have been extracted

ture, which is no larger than a hair at the time it begins its destructive work, has successfully defied man all through the ages. While known as "shipworms" the teredo and the xylotrya—a similar pest—are really not worms at all but molluscs, which are hatched out in enormous numbers and in the waters of moderate temperature reach maturity in an amazingly short time. When the tiny creature is first hatched it is so small that it can penetrate the most minute crack in the casing of a protected pile and it is for this reason that sheathings of metal or of concrete cannot be depended upon. Once attached to the wood, it begins to burrow toward the center and finally, if unchecked, will honeycomb the timber until it resembles a sponge. The surface of the pile is gradually washed away by the action of the water and unless repaired the entire pile will be completely eaten through, and will ultimately collapse.

In the Gulf of Mexico the ravages of the teredo proceed so rapidly that the average life of an unprotected pile is from one to two years, while piles have been destroyed in such short periods as from one to five months.

When we pause to consider that only the finest, straightest logs can be used for this purpose it will be seen what an enormous waste is caused by this little worm-like enemy which is apparently so insignificant. It is conservatively estimated that the annual timber loss due to the teredo and similar marine wood borers is more than eight billion board feet, and with the increasing cost of timber due to the depletion of our forests, the financial loss caused by the teredo has been growing more serious every year.

At Keswick

In mountain-girdled Keswick, once I sate
Beneath the stars, discoursing with a man
Whose plaid bespoke him of a highland clan
Renowned for sons, bold, true, and passionate,
Not far away, in moonlight armor, great
Skiddaw reposed among his warrior van;
The Derwent, near, a wandering minstrel, ran,
Hinting of deeds that legends old relate.
Soon, clouds arose to mar the glamoured night,
And charging winds manoeuvered through the spruce;
Yet still, up Scotia's ancient paths of might
Our spirits clomb, like those who scorn return,
Seeming, betimes, to hear the voice of Bruce,
Thunderous, upon the field of Bannockburn.

—C. G. Blanden

REMARKABLE LITTLE FRENCH CAR THAT MAY DISPLACE THE MOTORCYCLE.
It is shown in use as a delivery vehicle, but can very readily be converted to passenger service.

FOREIGN AUTOS OF LOW COST

By

W. F. BRADLEY

IF the initial cost of an automobile could be brought as low as that of a high-grade motor bicycle, and cost of upkeep could be made to compare with that of the two-wheeler, there are undoubtedly thousands of citizens in all countries who would be attracted to mechanical means of locomotion. The problem is one that has long been troubling European manufacturers, for in England and France there is a potential clientele who cannot be attracted to the motorcycle and cannot be induced to purchase even the cheapest type of car.

In the past the attempt at a cheap vehicle has been along the lines of big car design. Scores of these have been produced, with accommodation for one or two passengers, the power plant generally consisting of a single cylinder motor, transmitting power to the rear wheels in the usual way through a clutch, gear box and live axle. In its main features such a car is a reduction of higher powered and more costly vehicles. With a view to bring down cost still further, belt drive has been adopted, thus abolishing the differential, the clutch, and in some cases the gear box.

An example of this type is to be found in a new make of car, which has either a single or a two-cylinder motor, belt transmission and final drive to one of the rear wheels, by means of an enclosed chain. There is a change-speed mechanism in the form of a couple of dog clutches on the counter shaft, allowing for two speeds. The whole of the rear axle, chain and countershaft have a fore and aft motion to allow of slackening off the belt sufficiently to permit the engine to run free. The width of the car is low, but, with a view to sociability, the passenger's seat is only slightly to the rear of the driver's position. To place them exactly side by side would be impossible without increasing the width of the car. There is even room for an emergency seat or for luggage at the rear of the driver.

But there appear to be more possibilities by working along motorcycle rather than automobile lines. This at any rate has been the experience of European manufacturers, who have found it almost impossible to get below five hundred dollars on cars of the usual build, but have been able to produce what may be termed four-wheeled motorcycles for half this price. The lead, which is now being followed strongly by both English and French constructors, was given in a little car that is really nothing more than a four-wheel motorcycle. It costs very little more in the first instance than a high-grade motorcycle, the upkeep is

THOUGH THEY ARE SEATED TANDEM STYLE, THERE IS ROOM FOR THREE PERSONS.

APPEARS NEAT AND SATISFYING TO THE EYE WHEN FULLY EQUIPPED.

A SPEEDY FRENCH HOMEMADE RUNABOUT.
It looks a bit odd at first sight, but is exceedingly practical and convenient.

about the same, its speed is equal to that of a two-wheeler, and its comfort is infinitely greater.

It is a long, narrow, boat-like vehicle, mounted on four wire wheels, carrying its passengers tandem fashion, with the driver at the rear, and having a single or two-cylinder air-cooled motor under cover in front. The frame, consisting of two wooden members, is narrowed in front, the sides are enclosed, the top is closed in by the gasoline tank, while the front is left open to allow a free passage for the air. A single chain running under the footboards takes the drive to a countershaft, on each extremity of which are a couple of pulleys from which power is carried to the rear wheels by belts, as in a motorcycle. The two pulleys permit a quick change of gear ratio.

There is neither clutch, gear box nor differential. The rear axle is attached to the extremity of a pair of inverted semi-elliptic springs, the front hanger of which is pivoted, thus allowing the axle to be moved forward or backward by means of a lever at the driver's right hand. It is by this means that the belt can be slackened off to disconnect the motor. At the front there is a tubular pivoting axle, with a coil spring suspension. Steering is direct, with a large diameter steering wheel and steel cable connections.

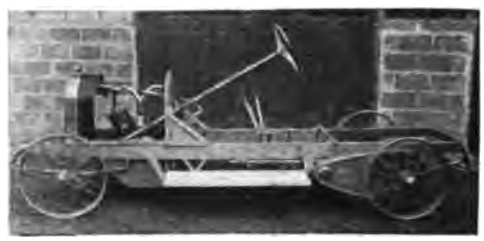
Any man who has had experience with a motorcycle is at once at home with this little car. As it can do all that he expects of his two-wheeler, and has the additional advantage of being able to carry a passenger and of offering some degree of comfort, it is not surprising that it has jumped into immediate favor among motorcyclists. Its use has not been confined to pleasure purposes, however, a large number of these little vehicles being in service in France for quick

delivery work. All the change necessary is the fitting of a box in the passenger's position. In some cases the touring model is convertible. On week days it carries drugs or groceries; on Sundays and holidays the seat is replaced.

During the coming season it is certain that a large number of light cars will be placed on the market, especially in England, the designers of which have been inspired by the success of this French car. Objection is made to the tandem position of driver and passenger, but it is very difficult to design a machine with two seats side by side, without abandoning the essentials of low cost and minimum weight.

There are optimists who believe that the four-wheel motorcycle will sweep out of existence the two-wheel type of machine. That, of course, remains to be seen. It is certain, however, that there will be a big demand for this new type of car. It weighs complete, only from 300 to 350 pounds, has an eight-horsepower two-cylinder air-cooled motor, chain transmission to a countershaft, and double belt drive to pulleys on the rear wheels. Such a car has speed that should make many a big car owner envious; it costs not more than fifteen per cent in excess of a motorcycle, is practically the same in upkeep, and has the advantage over the motorcycle of being capable of being stored in a very restricted area. For utility service, with calls for work over heavy roads, in snow, or amongst dense traffic, the four-wheeler has limitations. But these limitations are even more strongly felt by the motorcycle. As a little pleasure vehicle it has a remarkable future before it, and perhaps may shortly be found in America.

A Light French Car That Sells for Five Hundred Dollars.



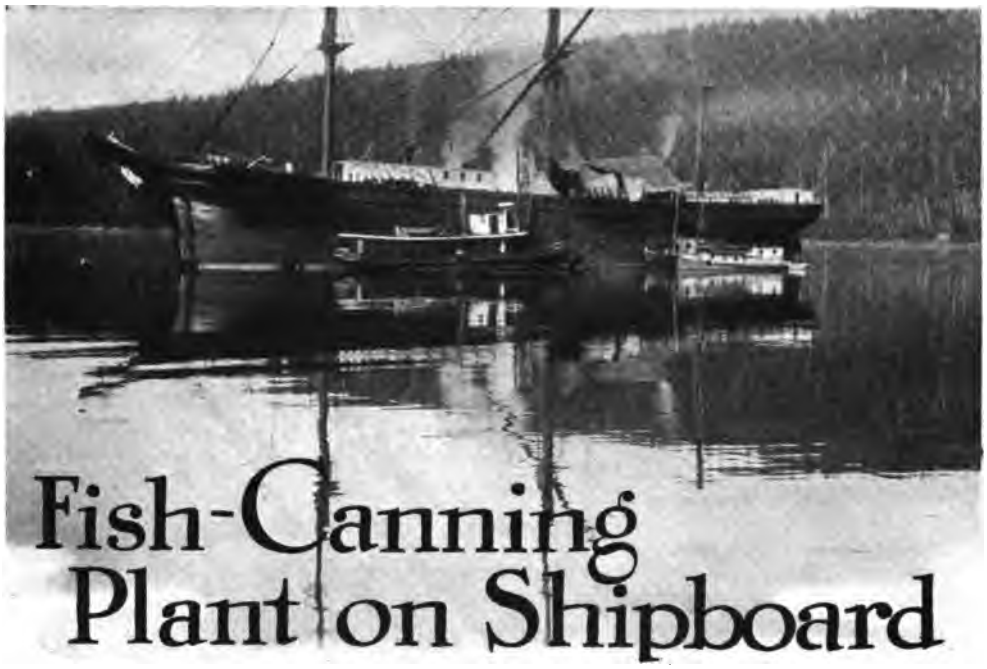
Racing Type of Little Auto Illustrated at the Head of This Article.

Sayings of the Ancients.

¶ I would rather be ignorant than wise in the foreboding of evil.

¶ It is not the oath that makes us believe the man, but the man the oath.

¶ A woman should be good for everything at home, but abroad good for nothing.



Fish-Canning Plant on Shipboard

by John H. Cobb

THE unique experiment of operating a floating salmon cannery was tried in Alaska last season and met with such success it is probable that if other suitable vessels can be procured, this will become a favorite plan of operation, as it permits of the shifting of the location of the plant from place to place as the runs of salmon increase or decrease, an impossible feat with a permanent land plant.

The famous old American ship, *Glory of the Seas,* a vessel that has carried the American flag to practically every port of any size in the world, and that was at that time laid up at Victoria, British Columbia, was purchased for an insignificant sum by a new fish company, and towed to Seattle, in order to be prepared for her new career.

The ship has two decks. The top deck was arranged for the receiving, cutting and sliming of the salmon, an elevator being attached to the side, up which the salmon were brought and then sent through a chute to the "iron chink," a machine which removes the head, tail and fins, splits the fish down the belly and removes the viscera, all in one operation. The fish are then put into the sliming tubs and thoroughly cleaned and scaled, after which they are cut into slices to fit the can. The living quarters of the workers are also on this deck.

DECK OF THE FLOATING CANNERY, WHERE THE SALMON ARE RECEIVED AND CLEANED.

The fish then pass through a chute to the second deck, where they are placed in the cans by machinery. The company installed machinery suitable for pack-

A VIEW OF THE MACHINERY OF THE SALMON CANNERY ON SHIPBOARD

ing sanitary cans, a new style of can which does away almost entirely with the use of solder and acid, thus reducing the amount of machinery and number of workmen required. The retorts in which the fish are cooked are also nearby, so that the actual canning is carried on exclusively on this deck.

After being cooked the cans are sent to the hold where they are cooled and then boxed and stored until it is convenient to ship. The lacquering and labeling is done in Seattle.

The vessel on reaching Alaska first anchored in Hawk Inlet. About thirteen thousand cases of salmon were packed here, the only difficulty experienced during this time being the securing of fresh water, most of which had to be brought from nearby streams in scows.

It was when the salmon run slacked off in the neighborhood of Hawk Inlet that the real value of a floating plant was demonstrated, by towing the vessel to Ketchikan, where a big run of salmon was then on, and where no difficulty was encountered in packing the remainder of her original catch of thirty-five thousand cases, and also about eight thousand cases additional which had been procured later.

LAUNCHES LADEN WITH A SALMON CATCH.

MRS. MARY E. EWING AT WORK ON PLANS AT HER DESK.

WOMAN CIVIL ENGINEER

By

RICHARD MORRISON

CHICAGO has the distinction of furnishing the first woman recruit to the ranks of the civil and consulting engineers. This is Mrs. Mary E. Ewing, widow of the late William Bion Ewing, one of the most prominent engineers of the Middle West, who died last spring. Mrs. Ewing has taken up and is carrying to successful completion work on various sewerage and water systems, costing approximately half a million dollars, which her husband had under way or in course of planning at the time of his death. She appeared before the boards of all the villages and the different companies with whom Mr. Ewing had contracts, and it is a remarkable tribute to her technical knowledge and executive ability that each village and each company unhesitatingly passed the contracts into her hands for completion of the work.

Mrs. Ewing's training was secured by assisting her husband with his work, in which she was intensely interested, throughout their married life, a period of twenty-five years. Much of Mr. Ewing's planning for the larger contracts was done in the quiet of their home, and so Mrs. Ewing had an opportunity to observe to the best advantage his methods of work and his solutions of the various problems connected with it. They also read and studied together many of the technical books, while Mrs. Ewing took care of the maps, blue prints, tracings and other drawings, besides otherwise "serving as general office boy," as she expresses it. In addition to this, she

went with her husband on many trips of inspection to the scenes of the actual construction, and thus was enabled to become familiar with the practical side of the work.

Although Mrs. Ewing's entrance into a field of work heretofore unexplored by women has created widespread interest and discussion, she herself is the least excited of anyone by reason of her unique situation. She considers it the most natural thing in the world that, being familiar with her husband's work, she should have stepped in and assumed the mantle of his professional duties. She earnestly advocates every woman interesting herself in her husband's profession and associating herself with him in his business, since it not only draws them closer together, but has the practical value of making a woman independent and fortifying her against emergency. She considers that civil engineering offers splendid opportunities to women who have inclinations in that direction. In her opinion, there is no feature of the work that is outside of a woman's element, and put into actual practice she finds it extremely fascinating.

MRS. EWING INSPECTING A STORM SEWER UNDER CONSTRUCTION.

Mrs. Ewing's success furnishes additional proof that art, science, history—every branch of knowledge, is coming into a new renaissance. The day when woman's activities in the business and professional worlds were confined chiefly to dressmaking, millinery, teaching school, trained nursing and a few other things, which, according to tradition, seemed peculiarly adapted to the feminine makeup, has long since passed. She is being given an opportunity to compete on an equal basis with men in almost every line of trade, and in nearly every profession, and she is making good in all of them with astonishing ease. When a woman of the present time attempts to climb the heights leading to commercial success, we no longer regard her with curiosity and suspicion, and wait to see her take a confidently expected tumble. Her place is secure, and her field of endeavor is gradually, but measurably, broadening. This world is assuredly a big place for all women who are creators, for women who "like to do things."

NEW SHEEP FOR THE WEST

By

ARTHUR CHAPMAN

THAT beneficently paternal figure known as Uncle Sam, who is lying awake o'nights figuring out ways and means of helping his children to help themselves, is conducting an experiment at Laramie, Wyoming, with the idea of developing a typical American sheep that will thrive amid Western range conditions and that will advance the nation's supply of wool and mutton enormously.

America has not taken the position it deserves among sheep-producing nations, because there is no breed of sheep that

SHEEP IN THE RANGE
Scarcity of water is one of the reasons for rapid

can be called typical and that will not deteriorate among natural surroundings in this country.

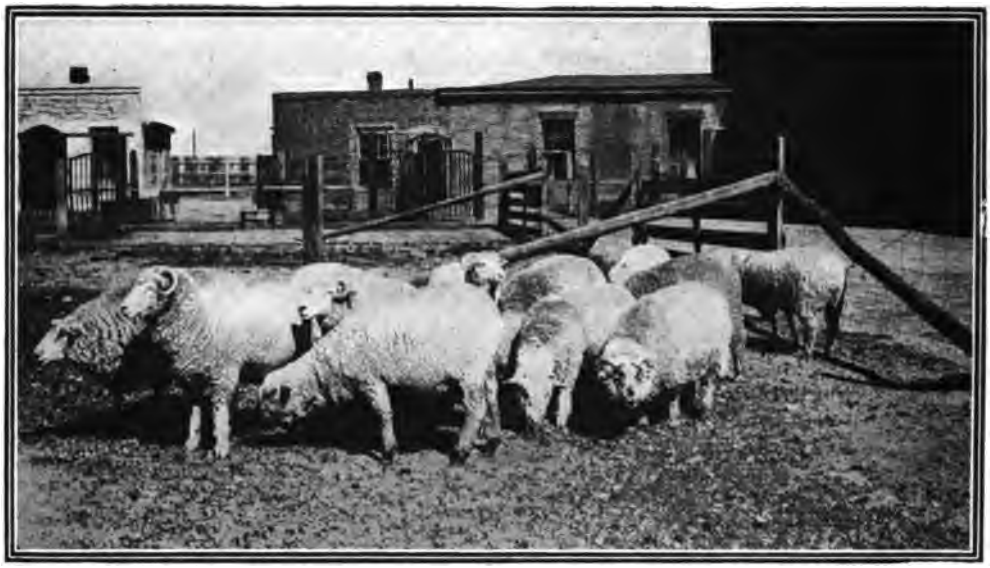
Here steps in Uncle Sam with a remedy. It is known that Nature is ready to adapt animal life to all circumstances, if given half a chance. So the government has established an experiment station at Laramie, Wyoming, in the center of the great Western sheep belt, and is endeavoring to produce a typical range sheep that will thrive among the comparatively harsh conditions of the high plains country and that will yield a maximum amount of wool and mutton.

COUNTRY.
deterioration of imported sheep in the West

ABANDONED PENITENTIARY AT LARAMIE, WYO., WHERE GOVERNMENT SHEEP BREEDING IS BEING CARRIED ON.

The importance of such an experiment is easily understood, when it is estimated by experts that raising the average wool clip of this country one pound a year would increase the value of that crop $10,000,000. Doubling the wool clip, which is not impossible under scientific improvement of American sheep, would render many millions of dollars' worth of wool importations unnecessary and would practically put the nation in an independent position in that respect.

The sheep imported for breeding purposes generally come from humid regions. The Rambouillet sheep, for instance, will thrive in the seacoast states, where climatic conditions are not unlike those of France. But transfer the same sheep to the West and there is another story to tell. The dry soil, heavily mineralized and charged with alkali salts, is entirely different from the moist soil to which the sheep has been accustomed. The grass of the high plains region is short and scanty, and contains less water, more mineral matter, more protein, and less variation in nutritive qualities throughout the year. The sheep must "rustle" in order to keep off hunger, for this short, rich grass, which literally cures itself on the stem in the dry atmosphere of the West, is thinly distributed on the plains. The slow, heavy sheep from the humid regions, being used to little exercise, soon shows the effect of constant walking. It loses flesh and puts on heavier bone. The climate, too, begins to work changes in other ways. The air is dry and clear, and there is greater wind movement. The changes in temperature are sudden. There begins to be a marked variation in the wool production. While the nitrogenous grasses favor heavy wool production, and the cool climate increases growth, the dry-



FINE FAT SHEEP AT THE LARAMIE EXPERIMENTAL STATION.

IMPORTED RAMBOUILLET LAMBS BEING FED ON A WESTERN SHEEP RANCH.
They fail to live up to their pedigrees when compelled to "rustle" on the range.

ness of the air and the severity of the winters decrease the amount of "yolk" in the wool. The natural oils, which go to the fleece in a mild climate, especially where humid conditions prevail, are given to the body to increase the animal warmth. This decreases the weight of the fleece, and does much to account for the startling variations of the wool clip in various Western states, the average fleece in the southwest going as low as six or seven pounds, while Western Oregon, owing to its mild, comparatively humid climate, sometimes averages nearly fifteen pounds to the fleece.

Sometimes the flocks on the Western range in this country must go for two or three days without water. Many of the

streams and water holes, too, are heavily impregnated with alkali. Most of the sheep herders in Wyoming, who know the evil effects of alkali upon the human system, are never without a supply of vinegar. By "cutting" the alkali water with a liberal application of vinegar, and then adding sugar, the herder fills his canteen with a drink which is not unpleasant and which mitigates the evil of alkali poisoning.

What can be accomplished by persistent breeding of high-class sheep was shown by a Wyoming ranchman, who, several years ago, became alarmed at the poor condition of his flocks. He spent several thousand dollars on fine imported bucks, and in ten years increased the clip from a third of his flock to more than fifteen pounds—something phenomenal for Wyoming. Such private experiments have shown the plastic nature of the sheep, and have proved that it is possible to achieve astounding results under scientific direction. At the government experiment station at Laramie there are many splendid examples of the finest varieties of sheep. The finest were taken to the Alaska-Yukon-Pacific Exposition and won forty-six first premiums, besides several secondary prizes. All these sheep were fed under typical range conditions near Laramie. The physical changes that are being wrought in the government's flocks are recorded with the minutest care. It is desired to produce an animal that will retain its "rustling" qualities, but which, at the same time, will produce a maximum amount of wool and mutton and that will not have to be constantly "built up" through fresh importations.

Wisdom of Publius Syrus

¶ Even a single hair casts its shadow.

¶ To do two things at once is to do neither.

¶ A fair exterior is a silent recommendation.

¶ He sleeps well who knows not that he sleeps ill.

¶ Treat your friend as if he might become an enemy.

¶ He who has plenty of pepper will pepper his cabbage.

¶ Let a fool hold his tongue and he will pass for a sage.

EQUIPPED FOR THE EXPEDITION INTO THE MORE SPARSELY SETTLED REGIONS OF BRITISH COLUMBIA. WHERE CANADIUM WAS FOUND.

CANADIUM—MORE PRECIOUS THAN GOLD

By

DR. LEONARD K. HIRSHBERG

ASKED to name the five great events of the year recently closed, President Taft enumerated the treaty with Japan, the demonstration of the complete success of typhoid vaccination, as proved by the treatment of 150,000 troops; the prospective arbitration treaties with Great Britain and France, the progress on the Panama Canal and the court decisions in the Standard Oil and Tobacco Trust cases. Yet none of these compares in importance with the discovery of a new substance, Canadium, which marked the very opening of the new year.

The name Canadium was adopted for the substance in honor of the country in which it first was found, the discovery having been made in British Columbia. By its discoverer, Andrew Gordon French, the element is placed in one of the two vacant niches between platinum and gold, long predicted by Mendeleff for completion of the noble group represented by platinum, gold and silver.

Mr. French in telling of his marvelous find promises that within a short time he will present specimens of the metal and a paper upon the treasure to the Royal Society of England. The details of the discovery and an exhaustive analysis of the new metal then will be given to the world of science, and the unbounded commercial possibilities for

Canadium also will be unfolded at the same time.

Indeed, to the world in general the commercial value of the discovery will appeal far more than the scientific side, as introducing a treasure more valuable than gold, of even more beauty, and equally adaptable to all the purposes for which gold now is utilized. As jewelry in itself and in the setting and embellishment of precious stones Canadium at once will take a front place; in achieving elaborate decorative effects it will appeal especially to the artist, while in gross, utilitarian lines it may even be adopted for the filling of teeth, instead of gold or other substances. The commercial possibilities seem without limit.

By the scientist and chemist, on the other hand, the discovery of Canadium will be pronounced almost a realization of the dream of the alchemist, and as the first achievement of science in the twentieth century worthy of imperishable record in the annals of history.

IN THE CANADIUM COUNTRY. Mr. French shows a find to his assistants.

ANDREW G. FRENCH, THE DISCOVERER OF CANADIUM, IN HIS LABORATORY.

From disclosures so far made by Mr. French Canadium, it seems, is of a beautiful white, with lustre more brilliant than diamonds, while in substance it is more easily worked than other fine metals. Found in dike rocks beyond Nelson, British Columbia, in lumps ranging in weight from a few pennyweights up to three ounces, it is isolated in pure crystalline granules. By the naked eye these, and the short rods varying from a half-millimeter in length to a tenth in thickness, may be seen as metallic particles and as scales of scintillating splendor, in ores and minerals from which platinum and palladium are obtained.

When taken out, Canadium may be found alloyed with a volatile substance—either osmium or another new gaseous element. The alloy is bluish white, and, when exposed to the currents of a blow pipe, this alien substance is driven off. Then there is left behind a brilliant, sheeny bead of pure Canadium. The new element is much softer than platinum, rutherium, palladium or osmium, and is much more easily melted. Like gold and platinum, it remains untarnished by water and unblackened by continuous heat, and, also like those precious metals, it is affected by what chemists call *aqua regia,* that is, concentrated acids.

Distinguishing Canadium from silver, which it superficially resembles—and with which, says Mr. French, it hitherto may have been confused—is its action with table salt; silver precipitates this sodium chloride condiment, Canadium does not. And, unlike silver, it does not become black when mixed with sulphur compounds. The melting point of Canadium is conspicuously lower than that of platinum, or gold or silver, and also it carries a negative electric charge, while, on the other hand, silver is positively charged.

Of all its wide commercial possibilities, however, Mr. French predicts that Canadium will be of especial value in the equipment of searchlights, its dazzling resplendence being especially adaptable to this purpose.

It has, however, scores of other uses.

EASTER EGGS GALORE.

NATURAL EASTER EGGS

By

F. G. MOORHEAD

"WHY don't they color Easter eggs on the inside, too," a small boy asked Professor Lippincott of the Iowa State College of Agriculture, and with all his knowledge of science the college professor was not able to give a real good answer why such a thing could not be done in this day of scientific marvels. And as there was no real good reason why the thing couldn't and shouldn't be done, he set about to do it.

The coloring of animal tissues by the use of the dye Sudan III was known as long ago as 1896, by an Italian scientist named Daddi. Prof. J. E. Rice of Cornell University and Dr. Oscar Riddle of Chicago University have conducted experiments with Sudan III and with another dye called rhodamine red with good results, but it has remained for Prof. W. A. Lippincott, inspired by a small boy's curiosity, to go farther than any of the others named and show the relation between the food fed to the hen, as the raw material, and the egg, as the finished product. He has proved that the hen is nothing more or less, after all, than an egg factory, the output of which depends upon the raw material which is brought into the factory to be worked over.

The first thing Professor Lippincott did was to decide that if he were to go into this interesting matter he might as well make the result picturesque as well as scientific. And so he decided that if he could color the albumen and the yolk of the egg at all, he would try to color them cardinal and gold, the same being the colors of Iowa State College. The second thing he did was to send to an

old French dyer in Utica, New York, for a shipment of regular commercial analine dyes, notable in the consignment being Sudan III, rhodamine red and methylene blue. The third thing he did was to trap-nest a dozen hens on which to try the experiment, their segregation being necessary in order that the diet of dyes might be tried on the same hens over and over again. Otherwise there might have been cases of mistaken identity when the daily task came around of forcing the hens to swallow the dyes.

When the dyes arrived, Professor Lippincott filled several hundred capsules. These he took over to the chicken house and going to the trap-nested hens he forced a capsule down the throat of each squawking one until the rounds had been made.

The first capsules were administered at six o'clock Sunday night. The yolk of the egg which was laid at 10 o'clock Tuesday morning had a distinct band or circle of scarlet around the periphery of the yolk. The experiment thus had its picturesque value, but more important was the showing as to the length of time necessary to manufacture the albumen, the two shell membranes and the shell itself, all of which surrounded the scarlet periphery of the yolk.

Professor Lippincott continued his experiments. He very shortly found that Sudan III colors the yolk of the egg only, while rhodamine red colors the albumen only. Either dye fed separately acts only on one part of the egg, both dyes fed together result in changing the color of both the albumen and the yolk. Equally interesting was the discovery that Sudan III does not color the yolk solidly red, no matter in what quantities fed, but simply colors it in concentric rings, the rings of scarlet in the solid yellow of the yolk showing the number of days the dye has been fed to the hen while that particular egg was in process of manufacture.

The eggs laid soon after the first feeding of the dyes were banded near the outer part only, and it was absolutely impossible to color the yolk solid. From these two facts Professor Lippincott learned that the yolk is built up by successive layers of fat deposited on the surface of the material already present and not by any intermingling of present with previous manufacture.

NATURAL EASTER EGGS, COLORED ON THE INSIDE.
Note the rings within the yolk, each ring indicating one day's feeding of the dyes.

When the dyes were fed at stated intervals the rate of growth within the yolk was obtained. It was possible in this way, not only to calculate the number of days required to completely develop the yolk, but also to study the relative amount of material added during the stages of its formation. The deposition of yolk material is very slow at first, but exceedingly rapid at the end, the outer bands being much broader as well as greater in circumference.

All this, quite naturally, was interesting to the scientist, but not to the small boy. The thing he took interest in was that the eggs, when hard boiled and cut in two, showed the albumen of the egg stained a delicate purplish pink, and the yolk a series of alternating rings of natural yellow and artificial red. Professor Lippincott had secured the picturesque result desired; he had natural Easter eggs colored inside with the scarlet and old gold of Iowa State College.

Professor Lippincott's curiosity went farther. He wished to see if the colored eggs would hatch. He found out that they would. Hatching an egg colored with Sudan III he discovered that he had brought into the world a new species of chick—downy little creatures whose bodies were colored pink wherever they contained fat, especially along the breast and the abdomen, just underneath the skin. By hatching an egg colored with rhodamine red, he secured a little chick all the muscle tissues of which were a bright pink. The enthusiastic poultryman saw visions of a new and lucrative business: hatching and selling fluffy, pink chicks for the Easter trade. But, unfortunately, the pink faded and disappeared. Upon witholding food from Sudan III colored chicks until four days of age the fat tissues in the body were used up in developing energy and heat. Consequently the color was passed away and lost and with it went visions of a glutted market of fluffy pink chicks to fill the childish heart overflowing with joy.

PROF. W. A. LIPPINCOTT, THE MAN WHO COLORED NATURAL EASTER EGGS ON THE INSIDE, AND ONE OF THE TRAP-NESTS WITH ONE OF THE HENS ON WHICH THE EXPERIMENTS WERE TRIED.

THE HENNERY AT IOWA STATE COLLEGE WHERE FOWLS LAY EGGS WITH COLORED CONTENTS.

But Professor Lippincott was not discouraged. The mother hen had thrived on dye, the little chicks might as well take up a capsule diet. And so the dye was fed daily to the fluffy little things just growing their first feathers. The result was a decided pink color in the plumage. Rhodamine red did not stain those parts of the feather already grown, but only that portion grown while the dye was being fed. When the chickens were about four weeks old the dye was withheld for seven days. After this the new feather growth showed no color until the dye was fed again. The result was a reappearance of color at the base of the growing feather. A broad white band, indicating the growth for the days during which the dye was withheld, separated the two areas of color.

Still ambitious and curious, Professor Lippincott fed Sudan III to fattening fowls. The exact extent and amount of the fat deposits was shown by the pink color resulting. The color did not show up in layers as in the egg, but one dose served to color all previous deposits of fat, due presumably, to the circulation within the fat tissues. And to cap the climax and make the great American hen patriotic to the extent of carrying about in its anatomy the national colors, Professor Lippincott fed his chickens methylene blue, with the result that their bones were given a bluish tint.

Here the matter rests today: Professor Lippincott has given the inquisitive small boy an Easter egg colored inside with the college colors. He has brought into the market pink and white chicks to please the heart of the children. But, above and beyond all this, he has proved a direct relationship between the raw material fed the hen and the make-up and appearance of the finished product, the egg.

"The experiments show, first, the growth of the egg every day; second, the relation between the food and the egg; third, the length of time for the formation or manufacture of the entire egg," says Professor Lippincott, discussing the work. "We have known that we can feed the odor and taste of onion into the egg. We have known that too much oil meal gives the yolk of the egg a dark greenish cast. We have known that green food makes yellow eggs. But now we can show, in such a striking manner that seeing is certainly believing, the effect of each day's food upon each day's product toward the complete egg. The food value and the hatching value of the egg are unchanged. But who can say that we will not progress from this experiment, interesting and practical both, to others which will change the food value and perhaps even the hatching value of the egg? It is a study which must inevitably come to claim more and more attention from the scientist and the breeder."

While Professor Lippincott does not care to go on record as recommending his colored eggs for food, he has proved, on himself, that they are not poisonous.

PROBLEM OF BUG TRAVEL

By

RENÉ BACHE

IMAGINE grave scientists in the act of watching the travels of a beetle, taking turns at the work in night and day shifts, so as to keep the insect under continuous observation.

Seems a funny notion, does it not? And yet the matter is of much importance, in its bearing upon certain very practical problems. For the insect in question seems likely to prove extremely valuable, inasmuch as it is a wholesale destroyer of caterpillars of all kinds. Imported only recently from Europe, under the direction of Dr. L. O. Howard, the government's entomologist-in-chief, this beautiful green beetle, about an inch in length, has already been colonized in many places in Massachusetts, where it is multiplying and spreading with most gratifying rapidity.

The distribution of the species, as well as its prospect of survival, depends largely upon the ability of the larva, or grub, to travel in search of food. In order to ascertain the extent of its capabilities in this line, a young one, newly hatched, was placed on a table which had been covered with a roll of paper in such a way that the latter could be reeled back and forth across the board by turning spools at each end. Escape at the sides was prevented by the upturned edges of stiff wrapping-paper put beneath the roll.

A record was then made with a lead pencil of every movement of the grub, the experiment being carried on continuously until it died of fatigue and starvation. Although no food or water was provided, it remained active for seventy-two hours, so that night and day

shifts of observers had to be used. It travelled far more rapidly than was expected, and from time to time a fresh roll of paper had to be substituted, in order to furnish additional territory for the insect to march over.

In all, eleven rolls were thus used, and careful measurements showed that the grub during its brief span of life travelled 9,058 feet, or nearly one and three-quarter miles. Its greatest speed was close upon five feet per minute, and during the first twenty-four hours its average rate of progress was three and two-thirds feet per minute. During the experiment it lost eleven grains, or a little more than one-third of its original weight.

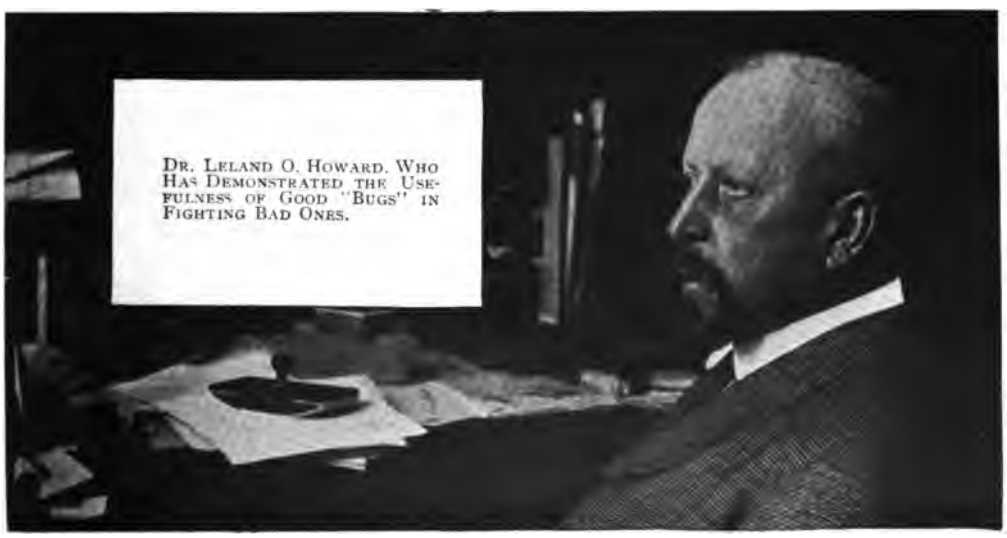
This shows the remarkable vitality possessed by the larvæ of the imported beetles, and indicates that under the most adverse conditions they would be able to survive several days and travel a long distance before succumbing to the effects of hunger and thirst.

The beetles were fetched from France and Italy in pasteboard matchboxes, such as those used for safety matches, each box containing a small quantity of wet moss and a single insect. A lot of these matchboxes were packed in a wooden box, and in this shape they came through very well, about ten days being required for the trip. Other beetles of the same species were brought from Japan in the cold rooms of steamships, giving encouragement to an artificial hibernation, and on arrival at Vancouver were forwarded by express and kept iced until delivered at the Massachusetts State Laboratory, at Melrose Highlands, near Boston.

At that place special beetle-rearing houses have been built, with breeding compartments and all requisite equipments for hatching and rearing the grubs. Large hibernating cages are employed to hold the breeding stock over the winter, so that the insects may be ready for use in spring. For this purpose boxes half buried in the earth serve admirably, the tops and bottoms being taken off and replaced with small-mesh wire net.

When the grubs are reared in the laboratory for distribution in "field colonies," it is desirable to hasten their development as much as possible. Jars of earth in which the female beetles have been put to lay, and which contain their eggs, are placed in the bright sunshine on cool spring days, to accelerate hatching. And, when the larvæ appear, an abundance of food is given them—not only to make them grow fast, but also to prevent them from devouring each other; for they are fierce cannibals.

Throughout the summer the services of one man are continuously required to collect caterpillars for beetle food. When caterpillars are scarce, the beetles are fed on chopped beefsteak. Cold-storage grubs, brought out in March or April, would starve if they had to depend upon

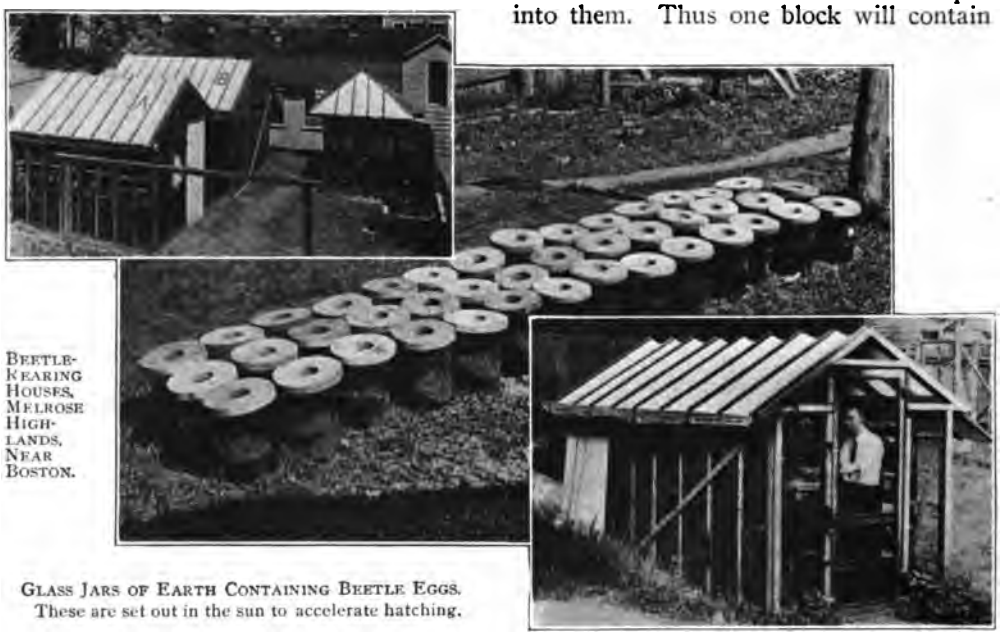


DR. LELAND O. HOWARD, WHO HAS DEMONSTRATED THE USEFULNESS OF GOOD "BUGS" IN FIGHTING BAD ONES.

PAPER ROLLS USED TO FOLLOW THE TRAVELS OF ONE BEETLE GRUB.

though always exhibiting a preference for a good fat caterpillar, in proper keeping with a good healthy instinct that ought not to be discouraged, under any circumstances, one would think. Nor, indeed, is any one discouraging it.

The best method of distributing the grubs in field colonies thus far discovered is to bore a double row of ten holes through a block of wood, the bottom of which is covered with fine-mesh copper wire to provide air, while the top has a sliding cover so arranged that the holes can be closed as fast as the larvæ are put into them. Thus one block will contain



BEETLE-REARING HOUSES, MELROSE HIGHLANDS, NEAR BOSTON.

GLASS JARS OF EARTH CONTAINING BEETLE EGGS. These are set out in the sun to accelerate hatching.

IN THE BEETLE-REARING LABORATORY.

their accustomed and natural diet. But they get along very well on beefsteak—

A CALOSOMA BEETLE, WHICH IS IMPORTED TO FIGHT "WICKED CATERPILLARS," DESTROYING ONE OF THE PESTS.

twenty grubs, each in a hole by itself. Ten blocks, strapped together, hold two hundred grubs—enough for a good-sized colony. When desired, they can be

METHOD OF IMPORTING FROM EUROPE BUG-FIGHTING BEETLES.

set free in a moment by withdrawing the covers, inverting the blocks, and rapping the latter sharply to shake out the occupants.

Many adult beetles, as well as grubs, are thus liberated. The most important work expected of these insects is that of keeping down the numbers of the dreaded gipsy-moth caterpillars; but is thought by the government bureau of entomology (which is cooperating with the state of Massachusetts in this work) that they may prove very useful in fighting caterpillars of other kinds elsewhere in this country, a great many of which abound.

CONTRIVANCE FOR CARRYING THE BEETLE GRUBS AND PLANTING THEM OUT IN FIELD COLONIES.
For each insect a separate hole is provided.

Spring

Spring, the sweet Spring, is the year's pleasant king;
Then blooms each thing, then maids dance in a ring,
Cold doth not sting, the pretty birds do sing,
  Cuckoo, jug-jug, pu-we, to-witta-woo!

The palm and May make country houses gay,
Lambs frisk and play, the shepherds pipe all day,
And we hear aye, birds tune this merry lay,
  Cuckoo, jug-jug, pu-we, to-witta-woo!

The fields breathe sweet, the daisies kiss our feet,
Young lovers meet, old wives a-sunning sit,
In every street, these tunes our ears do greet,
  Cuckoo, jug-jug, pu-we, to-witta-woo!
    Spring! the sweet Spring!

—*T. Nashe*

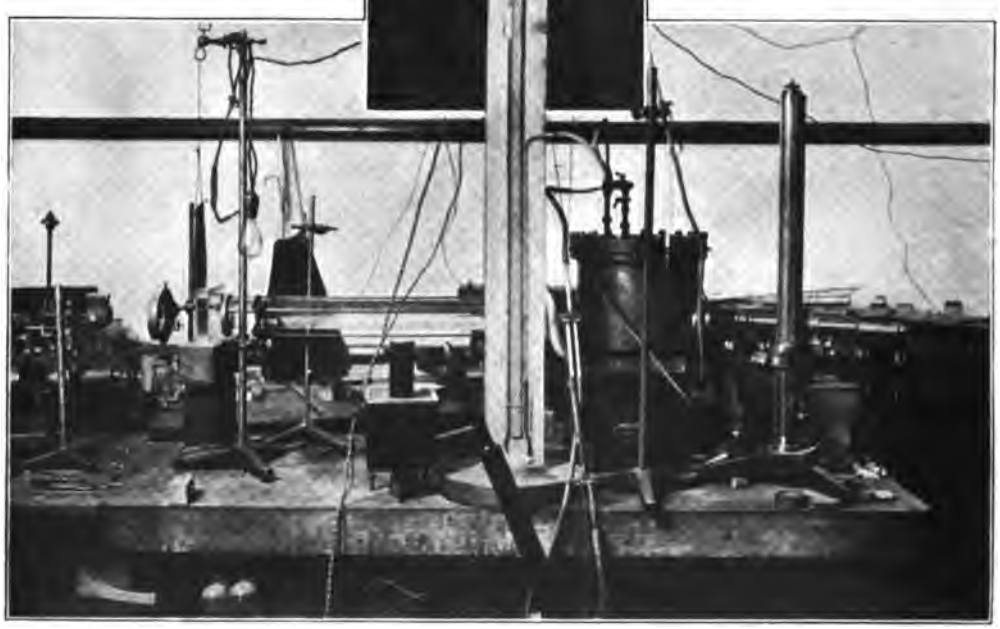
MEASURING THE SMALLEST THING IN THE WORLD

By

R. H. MORTON

THE smallest thing in the world, an electron, which is minute beyond comprehension, has at last been isolated and its charge accurately measured. The man to do it was Professor R. A. Millikan, of the Ryerson Laboratory, University of Chicago, and his success stands forth as one of the cleverest, and at the same time one of the most important, achievements of modern physics.

The text books tell us that the smallest part of a substance that can exist separately and still retain its composition and properties is a molecule. A molecule is a combination of two or more atoms of any element held together by chemical attraction or affinity. An atom, therefore, is smaller than a molecule. But an electron is very minute even in comparison with an atom, for



PROF. R. A. MILLIKAN AND HIS APPARATUS FOR ISOLATING AND MEASURING AN ELECTRON, WHICH IS MINUTE EVEN WHEN COMPARED WITH AN ATOM.

there are hundreds of electrons in a single atom of most of the common substances and the volume actually occupied by these electrons themselves is probably as small in comparison with the volume of the atom, as is the volume of the sun and the planets in comparison with the whole volume of the solar system.

Scientists have long believed that electricity was just as definitely atomic as any other substance—a mass of iron, for instance. Professor Millikan has given additional proof of the correctness of this theory. He has demonstrated that there is a measurable and ultimate limit to the divisibility of an electric charge, and has accurately determined the value of the ultimate electric atom.

An ion is a molecule carrying one free electron, or atom of electricity. The diameter of a molecule is .000000007874 of an inch. It would take 1,000 molecules laid side by side in a row to make a speck long enough to be seen in the most powerful microscope. The diameter of an electron is about one hundred-thousandth that of a molecule. This means that one hundred millions of them would have to be placed in a row and then magnified a thousand or more times before the speck they made could be seen.

To illustrate again, let us suppose that one hundred million people began to count the number of electric atoms necessary to generate by electrolysis sufficient hydrogen to fill an ordinary toy balloon. If they counted at the rate of one hundred a minute, and kept steadily at it, never stopping to eat, sleep, or rest, it would take these hundred million hustlers something like four million years to complete the job.

Professor Millikan has not only solved a seemingly impossible problem, given additional proof of the atomic theory of electricity, and shown that a very satisfactory ocular demonstration is possible of the perpetual dance of the molecules of matter, but probably has made by far the most accurate of all determinations of the value of the fundamental unit. Nor is this all, for the improved value of this unit also carries with it corresponding corrected values of other things, such as the number of atoms per unit weight of any given element, and the mass of the unit itself.

The history of the atomic nature of electricity which has culminated in Professor Millikan's recent discovery dates back almost a century. Faraday was the first to prove that when an electric current is passed through a water solution of any one of certain substances, the substance itself is taken out of the solution. The extent to which this action takes place is dependent upon the quantity of electricity so passed, and upon the nature of the substance dissolved.

If the same current is passed in series through the water solution of such salts as copper sulphate sodium sulphate and silver nitrate, the weight of the metal deposited, or permanently removed from the solution, is directly proportional to the atomic weight of the metal itself, and inversely proportional to the number of hydrogen atoms necessary chemically to take the place of one atom of the metal. Repeated experiments proved that this proportionality held true under all conditions, and it was therefore regarded as certain that to each ion in a solution conveying an electric current there belongs a definite electric charge.

The natural inference drawn from these experiments was that electrical charges also are definitely atomic in their nature. For many years, however, there was no way to test this inference except in the case of any quantity of electricity used in the decomposition of an electrolyte, and even the most refined measurements could directly detect nothing less than the aggregate of countless millions of elementary charges.

Similar difficulties presented themselves in connection with the so-called cloud method of determining the elementary electrical charge, discovered by Sir Joseph Thompson about twelve years ago. This method, with modifications by H. A. Wilson, consists in observing first, the rate of fall under gravity of a cloud produced in an ionized fog-chamber, and second, the rate of fall of a like cloud when a vertical electrical field is superposed upon gravity. Here, too, all the deductions relating to the elementary charge were drawn from observations of the average behavior in electrical and gravitational fields of swarms of charged particles, and consequently the value of the unit charge was not determinable.

It was while experimenting with the cloud method about two years ago that Professor Millikan succeeded in balancing individual charged drops by an electrostatic field, a feat which led directly to his discovery of a way to isolate an ion.

The first process he employed consisted essentially in catching ions on droplets of water or alcohol, in then isolating by a suitable arrangement a single one of these droplets, and measuring its speed first in a vertical electrical and gravitational field combined, then in a gravitational field alone.

There were, however, several sources of error or uncertainty still attached to this method.

The substitution of oil for water or alcohol entirely freed the method from all of these limitations.

Through the study of the behavior in electrical and gravitational fields of this oil drop, carrying its captured ions, it was also possible to present direct and tangible demonstration of the fact that all electrical charges, however produced, are exact multiples of one definite, elementary electrical charge; to make an exact determination of the value of the elementary charge which is free from all questionable theoretical assumptions; to observe directly the order of magnitude of the kinetic energy of agitation of a molecule, and thus to bring new direct and most convincing evidence of the correctness of the kinetic theory of matter; and to demonstrate that the great majority, if not all, of the ions of ionized air, of both positive and negative sign, carry the elementary electrical charge.

By means of a commercial atomizer a cloud of fine droplets of oil is blown with the aid of dust-free air into a dust-free air chamber. One or more of the droplets of this cloud is allowed to fall through a pin-hole into the spaces between two plates of a horizontal air condenser, and the pin hole is then closed by means of an electromagnetically operated cover. The pin hole is closed to prevent air currents from passing through it and producing irregularities. The two plates of the air condenser are heavy, circular, ribbed brass castings about 8.5 inches in diameter having surfaces which are ground so nearly to true planes that the error is nowhere more than .008 inch. These planes are held about .6 inch apart by means of three small ebonite posts held firmly in place by ebonite screws. A strip of thin sheet ebonite passes entirely around the plates, thus forming a completely closed air space.

Three glass windows about .5 inch square are placed in this ebonite strip at the angular positions of 0°, 165°, and 180°. A narrow parallel beam of light from an arc lamp enters the condenser through the first window and emerges from the last. The other window serves for observing, with the aid of a short focus telescope placed about two feet distant, the illuminated oil droplet as it floats in the air between the plates. The appearance of this drop is that of a brilliant star on a black background. It falls, of course, under the action of gravity, toward the lower plate; but before it reaches it, an electrical field of strength between 7,500 and 20,000 volts per inch is created between the plates by means of a battery, and if the droplet had received a frictional charge of the proper sign and strength as it was blown out through the atomizer, it is pulled up by this field against gravity, toward the upper plate. Before it strikes it the plates are short-circuited by means of the switch and the time required by the drop to fall under gravity through the distance corresponding to the space between the cross hairs of the observing telescope is accurately determined. Then the rate at which the droplet moves up under the influence of the field is measured by timing it when the field is on.

This operation is repeated and the speeds checked an indefinite number of times, or until the droplet catches an ion from among those which exist normally in air, or which have been produced in the space between the plates by any of the usual ionizing agents like radium or X-rays. The fact that an ion has been caught, and the exact instant at which the event happened are signalled to the observer by the change in speed of the droplet under the influence of the field. From the sign and magnitude of this change in speed, taken in connection with the constant speed under gravity, the sign and exact value of the charge carried by the captured ion are known.

WILD SEEDLING OF THE GUTTA PERCHA TREE, WHICH IS BEING PROPAGATED BY THE UNITED STATES GOVERNMENT IN THE PHILIPPINE ISLANDS.

FARMING FOR GUTTA PERCHA

By

ROBERT FRANKLIN

THE fable of the goose and the golden egg is as old as the hills—as some of our younger hills, at least—but we seem never to have taken it to heart. Our ever-present greed is forever driving us on to new killings of our future welfare, just the same as if we had never smiled in conscious superiority at the impatient owner of that other goose. How future generations will smile at us—if they can spare time from cursing us for some of our bequests.

Here's a new one! Our gutta percha, that priceless material for its purposes—golf-balls, toilet-articles, submarine cable insulations and other similar and dissimilar necessities—is almost gone, because

SEEDS OF THE GUTTA PERCHA IN POTS FOR PLANTING.

we have cut down the trees to get in a hurry the precious sap from which it is made! A famine of gutta percha exists in the markets of the world, because we've been killing another goose, as it were.

It is a serious matter. And the only salvation for us—if we would continue to play golf and to cable home for more money—is "to raise more geese." The American government is leading the way in the propagation of this sort of poultry, with the Philippines as a poultry-yard. Which, being interpreted, is to say, that Uncle Sam is going to farm for gutta percha trees in this latest addition to his acreage.

Artificial growth of these trees is exceedingly important; and luck is with Uncle Samuel, as is usual with the energetic, in that he has found the greatest little gum-tree ever, growing wild in his own domain, just waiting for somebody's kindly hand to be extended in encouragement, to grow widely and well. The hand is being extended. The little gum-tree is being cultivated and gives big promise of being a very useful resource in course of a very reasonable time.

THE FRUIT OF THE GUTTA PERCHA.

Gutta percha is absolutely the only substance yet found that will effectually keep our cross-seas messages from slipping off their charted courses and going adrift. It is the only really truly insulator. The demand for it, for this purpose alone, has been so great within the past few years that it is little wonder that the natives of the Malay Archipelago, where it mostly grows, have hunted it with eager rapacity that has run away with forehandedness. They gather it as a wild crop exclusively and their method is the method of the savage always—like his method of hunting or his way of war. In it he demonstrates his savagery: he kills for what he wants. He chops down the trees and leaves all but the gum which will bring him the immediate gold. Probably he does not even know that he does not need to do this, but his ignorance does not affect the outcome of his plan of procedure. But our blame is no less than his, for we have let him do it—because we were in a hurry, too.

A trifling little 25,000 pounds of the product was all that the year 1845 brought forth. Twelve years later, the Malay Archipelago exported 530,000 pounds. Twelve years after that, Sumatra alone sent out 300,000 pounds, and Borneo more than nine times as much—2,864,000 pounds. And it is estimated that, in order to collect so vast a quantity of the gum, the natives must have ruthlessly sacrified more than 5,000,000 trees.

Now the trees grow big, when they are allowed to get their growth at all; but they are very slow in the process. A good idea of their size may be gained from the fact that the lowest branches of some of the most stalwart of them are one hundred and forty feet from the ground, and that their girth is not infrequently as much as twenty feet. At the present time, however, the full-grown tree is a rarity, because the best have been slaughtered—that is the proper word—for the moment's profit. And the thing that has the sting in it, in the light of the present scarcity, is that the slaughter was unnecessary as would be the killing of a sheep for its wool. Tapping the trees for the gum is quite as easy as running a pneumatic clipper—and as effective.

Experiments, having in view the planting of gutta percha trees on a large scale, are now being made with good hopes of success. For this purpose the seeds have first to be procured. A wild tree of a desirable species having been found, all the jungle in its immediate neighborhood is cut away, leaving a small clearing about it—the object of this expedient being to keep off the monkeys, which are very fond of the pulpy plum-like fruits that contain the seeds. To prevent monkeys from climbing the tree, a sheet of tinned iron is fastened about the lower part of the trunk in such a way as to cut short any such attempt on their part. When the fruits are ripe, Malay boys, who are expert climbers, are sent up to gather them.

BOY CLIMBING GUTTA PERCHA TREE TO GET THE FRUIT FOR SEED.
The sheet of tin fastened to the trunk below is to keep off monkeys.

It then remains only to plant the seeds and grow the seedlings, from which, by the usual process of selection, superior varieties may be expected in the course of time to be obtained. This work is now being carried on at Buitenzorg—in Java—where is located the greatest botanical garden in the tropics, and also at Singapore. Seedlings have been sent to the Kongo and other regions deemed suitable for the purpose, so that there is hope for the future of gutta percha production. The tree, however, is very exacting in its climatic requirements.

Its wood is soft and spongy, and, when fresh cut, is marked along the grain with

black lines, which are channels containing the gum. Even the leaves, if torn in two, show numerous threads of the gutta percha. The method adopted in gathering the wild crop has been to fell the tree and cut a series of rings around the trunk, catching the fluid gum in suitable vessels as it runs out. Afterwards, it is boiled. But under conditions of cultivation, by annual tapping, the product would be obtained without injury to the tree.

THE SAP OF THE GUTTA-PERCHA TREE AS IT TRICKLES TO THE GROUND IS CAUGHT UPON HUGE LEAVES.

One important advantage of gutta percha for cables is that it does not deteriorate, but actually improves through submersion in sea-water. It is a perfect insulator, and its elasticity lessens the danger of breaking. The copper wire which is the core of the cable is coated with it, and outside of this is a wrapping of steel wire, to give tensile strength, with a final covering of tarred jute cord.

Song

Orpheus, with his lute made trees,
And the mountain tops that freeze,
Bow themselves when he did sing:
To his music, plants and flowers
Ever sprung; as sun and showers
There had made a lasting spring.

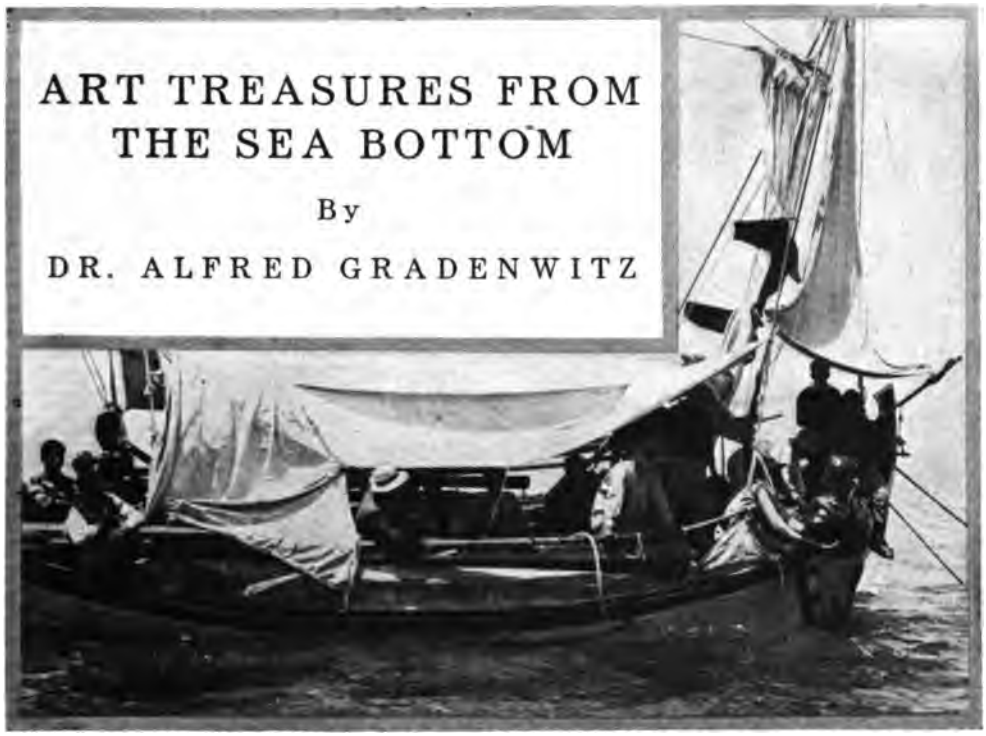
Everything that heard him play,
Even the billows of the sea,
Hung their heads, and then lay by.
In sweet music is such art,
Killing care and grief of heart
Fall asleep, or, hearing, die.

—W. Shakespeare

ART TREASURES FROM THE SEA BOTTOM

By

DR. ALFRED GRADENWITZ



GREEK DIVER—AT THE RIGHT—ARRIVING ON BOARD WITH HIS FIND.

A THRILLING tale of past splendor and greatness is told by an unexpected find recently made in the Tunisian Sea—a tale of days long gone-by, when the Roman republic—shortly before the advent of the Empire—had extended her sway over the whole of civilized Europe and began to exact heavy toll from all the countries under her rule.

Excavations in the north of Africa, where colonized by the Romans, have yielded a rich harvest, allowing whole cities to be reconstituted in their main lines—similarly to Herculaneum and Pompeii, unearthed from the ashes of Mount Vesuvius—but that the sea in those parts should likewise give up her share of art treasures, jealously kept for more than two thousand years, is doubtless a fact without precedent in the annals of archæology.

GREEK SPONGE FISHING BARGE STARTING OFF UPON AN ARCHÆOLOGICAL EXPEDITION.

Four years ago it was that Greek divers, engaged in sponge-fishing, off Mahdis in the Tunisian Sea, all of a sudden struck against some bulky impediment, which they at first were inclined to take for a set of big guns buried in the mud. Closer investigation, however, led to the surprising discovery that this was the remains of a stranded Roman vessel, laden with priceless art-treasures, which had obviously been lying in the deep for about two thousand years.

The Tunisian Office of Archæology did not hesitate in commencing the excavation of this extraordinary find, and after four years of toilsome work has completed its difficult task.

On the "sakoleve," as these fishing-boats are called, are embarked some Greek divers, and

from this boat they perform their dangerous work. In the rear those resting for a while are waiting for their turn, while on the prow are standing the men preparing for a dive and the foreman guarding the string to which the diver is attached. In the middle of the boat is installed a hand-operated pump, yielding the indispensable air supply. As soon as a diver has come up from the deep, another puts on his helmet and with a single jump springs from the deck into the sea.

Carried along by the lead weights attached to his breast and back, the diver makes a long downward way, the sea bottom here being at a depth of about 230 feet. As he reaches bottom the diver finds himself surrounded by a number of marble pillars, arrayed beside one another in six long rows. All around there, mixed up in a heap, are all sorts of marble pieces: capitals and bases of pillars, carefully hewn marble blocks, and other architectural elements. Among all this debris there are numberless fragments of terra cotta, ship's crockery, amphoras and all kinds of vases, having contained the oil, wine, water, victuals and other stuffs required for the crew. At the opposite end there are found enormous lead masses, one of which on being brought up, was found to weigh more than 1,300 pounds. These are the anchors, placed at the prow of the vessel. However, all this appears but dimly to the diver's eye, everything being buried in the all-pervading mud. In order therefore, to find some valuable object, the utmost care has to be employed in removing this mud, lest the water become turbid. Under the enormous pressure from above, the diver, who generally works on his knees, must be mostly content with seizing at hap-hazard some object or other, and taking it with him up to the surface. The ice-cold water currents only too frequent at the sea bottom sometimes interfere most seriously with his work, by endeavoring to carry him away from his place. In fact his task is not only exceedingly toilsome, but entails many dangers.

A Pillar Is Brought Up.

On trying to dig below and between the pillars, a more or less decayed wooden layer about eight inches thick is encountered, which is the deck of the sunken vessel. All the finer objects of art, bronze statues, and fragments of artistic pieces of furniture, are found underneath. The vessel, loaded too heavily, it appears, probably foundered suddenly and, on sinking to sea bottom, was soon covered with a thick layer of mud, which thus preserved all these art treasures in a state of absolute freshness. It is true that the objects brought up by divers are at first quite unrecognizable, but as soon as the mud layer and the shells adhering everywhere have been removed, the sculpture appears in all its original beauty.

As regards the marble sculptures, these have not been preserved so satisfactorily, any part protruding out of the mud having been corroded by shells and radiata. As, however, the mud frequently had even here formed a protective cover, many marble statues,—excellent copies from well-known originals—have been rescued, at least in all essential parts.

According to a quite plausible theory the vessel whose remains have been found, had been despatched from Athens to Italy, by the Romans, shortly after the capture of the Biraeus by Sulla, in 86 A. D., with rich spoils of art treasures, having been thrown against the north coast of Africa by adverse winds, giving way under the heavy load of her cargo.

THE FLY CATCHER OR VENUS FLY TRAP.

PLANT THAT CATCHES FLIES

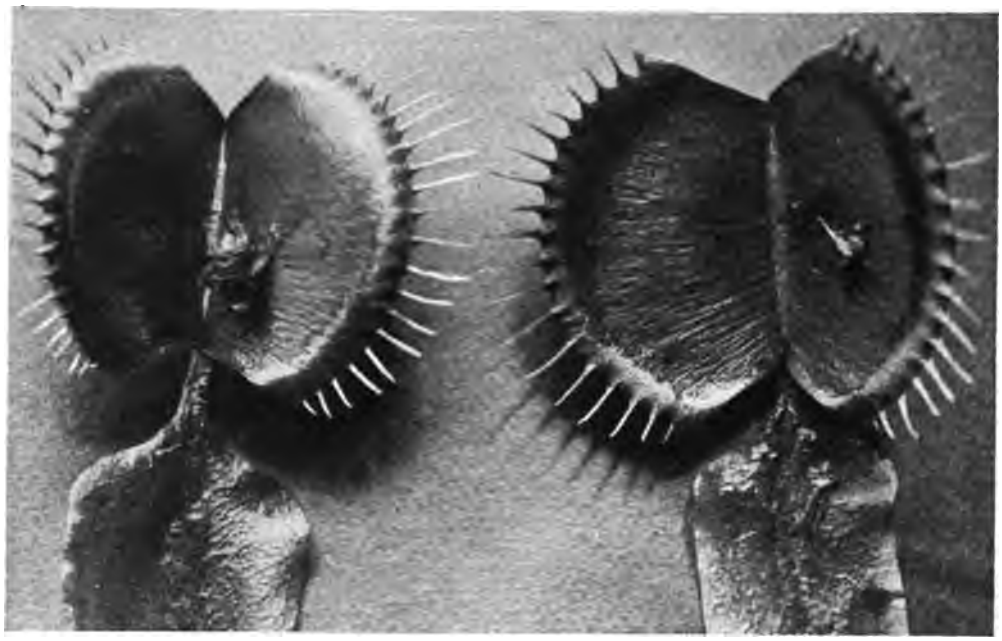
By

EDWARD F. BIGELOW

MOST persons know of the Venus fly trap. It is mentioned in the botanies and occasionally in a newspaper or a magazine as a wonderful plant growing in a swamp near Wilmington, North Carolina. A specimen placed in moss and rich earth will keep in a wet and swamp-like condition in the house. The shoots that appear at the time soon die, but new ones, more thrifty than the others, will grow under favorable conditions.

Such a plant can easily be put in any home provided one has an accommodating friend in Wilmington. The part known as the "fly trap" reminds one of a steel trap in appearance, but in action it is rather slow when irritated by a stick at the places on which the fly usually alights. It evidently knows the difference between a stick and a fly. It closes with a snap when a living fly alights on it, the quickness of movement depending largely upon the liveliness of the fly. This has been ascertained by experiment. If a fly has been caught with tweezers and pinched a little too hard, or if a fly is rubbed by the tweezers against the inner surface of the leaf, the leaf closes very slowly. But let a live fly alight within this trap and the leaf snaps together, and immediately the fly is buzzing and struggling to escape. The two parts of the trap hold the fly so firmly that it is practically crushed, and the animal juices are apparently absorbed by the leaf cells.

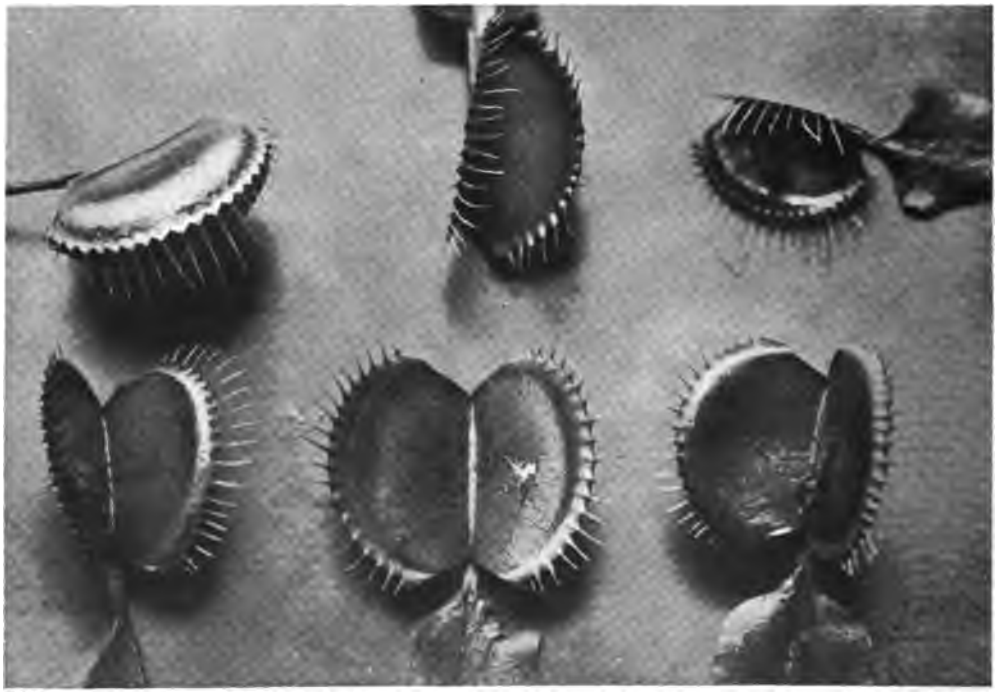
These cells, under close examination with a high power microscope, seem to consist of numerous small tubes into which, undoubtedly, the juice of the fly is taken. Within a few days the folded



CLOSING ON A PRISONER.

leaf slowly opens and the flattened dry remnant of the fly is permitted to drop out.

The plant is prolific in the growth of new traps, which are much more active when young. They have a spicy, snappy



TRAPS IN VARIOUS STAGES OF THE PROCESS OF CLOSING.

characteristic that may be expected only of the young. Several times a plant has been fed by flies caught on the window and pinched a little to stop their struggling. It has been ascertained by this experiment that the pinching must not be overdone, or the trap will not close. The plant does not want a dead fly but a thoroughly live one and it prefers to do its own killing. It seems to be rather difficult to observe the actual catching of a fly. It seems to be done quickly, but several times a leaf has been seen immediately after closing, when the fly was making frantic struggles to escape. The act must have been much quicker than it is when the leaf is artificially stimulated by the friction of a pencil or a stick.

ELECTRIC CARS WITHOUT MOTORMEN

By

F. M. LESTER

IT stands motionless on an ordinary railroad track, an ordinary gondola car, such as is used for the transportation of coal, only it is about half the customary size. Not a man is within a thousand feet of it. Suddenly it starts and moves down a grade dipping at an angle of twenty degrees. Now most cars would rush down such a declivity at a speed which would become cyclonic as the foot was neared. This little car actually slows its pace and gently crawls to the bottom, where, after pausing a moment, it starts again and continues along about its business. That involves stopping, while it is loaded, starting and climbing that incline again, this time with a load of ten tons.

The spectacle of an inanimate structure of wood and iron doing all this apparently of its own volition may be seen any day at a big stone quarry on the Drainage Canal south of Chicago. It seems none the less uncanny when the observer is told that a man in a tower on the edge of the pit controls the movements of the car. The operation in fact is one of the multitudinous performances of electricity when harnessed by modern engineers.

At this quarry, an area of thirty acres has been excavated to a depth of fifty feet. Around the sides of it runs a railroad which continues up the edge to level ground, where it describes a loop that carries it through the crusher plant and past the loading platform. Thus the track is like a figure 8 with the upper or smallest circle on the surface. The track is divided electrically into sections, each independent of the rest and each fed with current over a third rail in the middle. In your wonderment at the intelligent movements of the car you haven't noticed that. Neither have you remarked that the car is equipped with a motor and in addition a variety of simple but remarkable devices without which it couldn't perform as it does. The control of everything centers in a bank of switches in the tower.

CARS ARE HALTED AND BLASTS FIRED BY THE TOWERMAN HALF A MILE AWAY.

No Motorman Is on This Little Electrically Propelled Car. Which Is Traveling Up a Stiff Grade with a Ten-Ton Load.

When the car nears the brink of the big hole in the earth the motor is working away merrily, without a sign to indicate that it is anything but a motor. Just as it crosses the brink the pole changer inclines, striking an angle iron frame which shifts a lever, changing the connections on the car, so that the motor is converted into a generator. In its changed character it goes to work immediately after the fashion of electrical machinery, a resistance coil comes into play and the motion of the car is so retarded that it slips down the grade as though held back by a wire rope slowly paid out. When the bottom is reached the generator transforms itself into a motor again, current is thrown into the next track section and the car moves on.

Its business is to receive a load of broken stone from one of the huge mechanical shovels you see at work. It stops at exactly the right place to receive its load. How is that managed? By means of an automatic brake. A current ninety volts is used for braking, while 250 volts is needed to actuate the motors.

The car has still more duties to perform and proceeds about it in a semi-human manner. When the loading is finished a signal is given the tower man —a signal because the distance is too great to see clearly. He pulls a switch. The car loaded with broken stone runs around the pit works up the grade to the surface as easily as it rode down and moves into the building containing the crusher. It registers itself on entering and a short distance further weighs itself. A simple movement of a lever unloads it and with a brief stoppage the car is sent forward on another journey like the first.

There are a number of plants like this around Chicago operated by electricity and in nearly every case the electricity is transmitted to them from generating sta-

The Tower from Which the Cars Are Controlled.

tions miles away. Sometimes it is necessary to build a sub-station on the ground. In this particular plant all the heavy machinery in the building is run by electricity. The huge shovels scooping up stone are worked by current. So are the numerous drills you see hammering shot holes in the rock. The dynamite shots are all fired by the man in the tower. Even the great whistle that screams out that a shot is about to be exploded and that men in the danger zone must seek places of safety, is brought into action by a switch under his hand.

THE NEW TIDE PROPHET, WHICH GIVES THE DEPTH OF WATER AT ANY INSTANT, FROM ONE TO TWO YEARS AHEAD, OR LONGER IF NECESSARY.

FORETELLING THE TIDES

By

M. H. TALBOTT

ALTHOUGH it is a matter of little moment to most of us whether the tides of the ocean are high or low, to navigators, engineers who are calculating marine improvements, and hydrographic engineers who wish to lay plans for future surveys, it is a matter of intense interest and they eagerly consult the predictions of Uncle Sam's tide prophet. For a number of years the tide predictions have been the combined work of human and mechanical computers, but there has recently been completed and put in operation a machine in the United States Coast and Geodetic Survey, at Washington, D. C., which outclasses all competitors, for at one operation it gives the depth of water at any instant on any date from one to two years in the future, and longer if necessary. It is the invention of Mr. E. G. Fisher, who has been striving for fourteen years to bring the machine to its present state of perfection.

It looks very much like a huge printing press; its great skeleton frame of brass, steel and iron occupies a space eleven feet long, six feet high, and two feet wide, and from the dial indicators in the front to the opposite end it is a labyrinth of wheels, gears, pulleys, and chains. There are nearly three hundred gear wheels and pulleys in the machine, which are arranged in two main sections, one representing the time and the other the height of the tide. Two chains, each permanently fastened at one end, run through each section and their free ends are attached to indicating devices.

Tide predictions are based on certain conditions that influence the rise and fall of the oceans. At every port in the world

there is an instrument which indicates their fluctuations by a curved line on a sheet of paper, and from a long series of such observed curves computers have evolved the average of each component at each place. The formulae upon which Mr. Fisher's machine is based includes thirty-seven of these components. There is a set of gears to represent the sun's influence, another to denote that of the moon, others which act for the planetary movements, and still other sets which indicate local conditions.

The operator when beginning a set of predictions turns a crank which causes the wheels to rise or descend, thus lengthening or shortening the free end of the chain. This variation appears on the dials at the front of the machine, one pointer showing the height of water in feet and tenths, the other the day, hour, and minute of the occurrence. An electrical device stops the machine whenever high or low water is indicated, which thus tells to the operator what he should record in his table of predictions. While the figures are being recorded the machine is doing a still more detailed work. A strip of paper six inches wide and 380 feet long is moving automatically across the face of the machine, and while one pen is marking the hours and exact times of highest and lowest tides, another pen is tracing a curved line which shows the gradual rise and fall.

Mother Nature sometimes upsets all man's predictions for the far future, an easterly storm at, say, the port of New York, may force the water from the ocean into the harbor and cause a tide of abnormal height, which cannot be foreseen more than three or four days in advance. To insure the usefulness of tidal information under such conditions Mr. Fisher constructed an instrument called a tide indicator, which is now in use in the principal ports of the United States. It resembles the upper half of the face of a clock which measures twenty-five feet in radius. The height of the tide is indicated on the dial by a pointer connected to a float and the movement of the tide is shown by means of two black movable triangles, which when drawn together form an arrowhead. As the tide rises the arrowhead points upward. If it is at a stand they will point toward each other and if it is falling they will point downward. This instrument can be seen for a distance of five miles.

Thus step by step does man learn what Nature in all probability will do next. It is remarkable, indeed, that he can forecast the actions of great bodies of waters with these instruments.

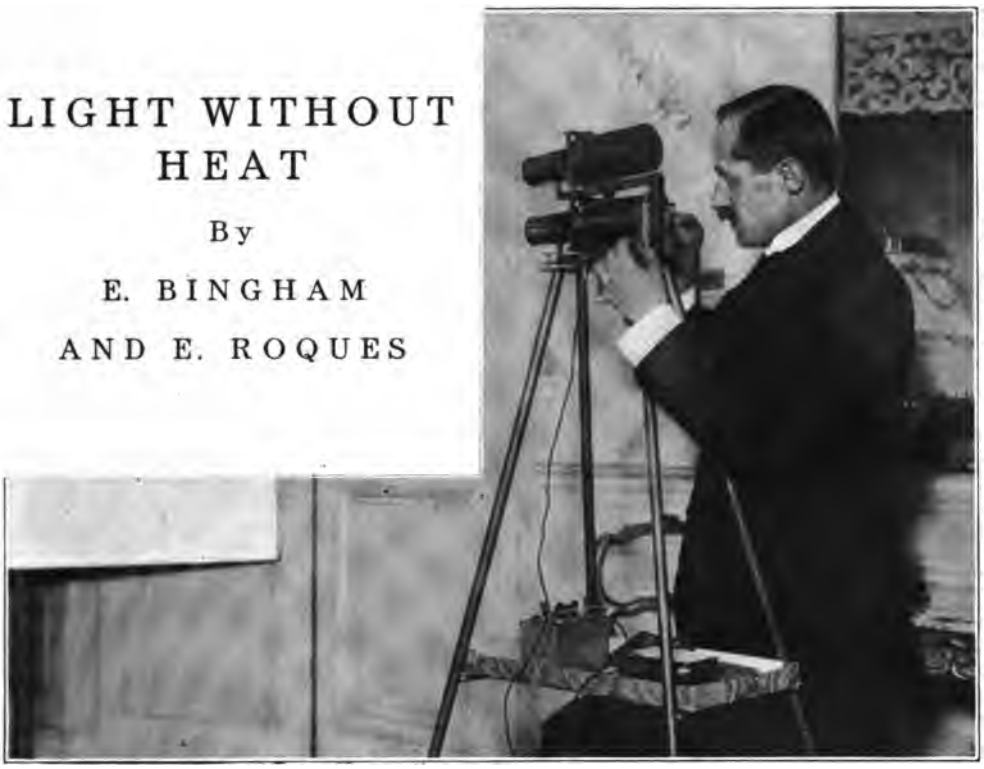
TIDAL INDICATOR, WHICH HELPS TO KEEP A CHECK UPON UNFORESEEN ACTIONS OF NATURE. This is an additional aid to the "Tidal Prophet." The instrument shows, in the illustration, a reading of 4.4 feet, falling.

LIGHT WITHOUT HEAT

By

E. BINGHAM

AND E. ROQUES



M. F. DUSSAUD HAS PRODUCED A "BOX OF COLD LIGHT."
His instrument is for use in scientific work where there must be no radiation of heat.

LIGHT can be dangerous. There are times when, either through its intensity or by reason of the heat that is generated in its making, the blessing may become a menace of a terrible sort. One needs to think only of the cinematograph to recall plenty of accidents and disasters resulting from the handling of light in close proximity to inflammable films. Eliminating the element of peril, there are processes in which light, by radiating heat, defeats the purposes to which it is put. Certain delicate operations of surgery are in this category. So is the study of living microscopic organisms under the lens—and the light. And these only suggest the multitude of cases in which a light without heat would be of invaluable help to science.

M. F. Dussaud, of Paris, has produced what he calls "a box of cold light," and appears to have solved the difficult problem in a very simple and effective way. He has already applied his device to the magic lantern, the cinematograph, the microscope, surgery, and the making of luminous signs and color photography.

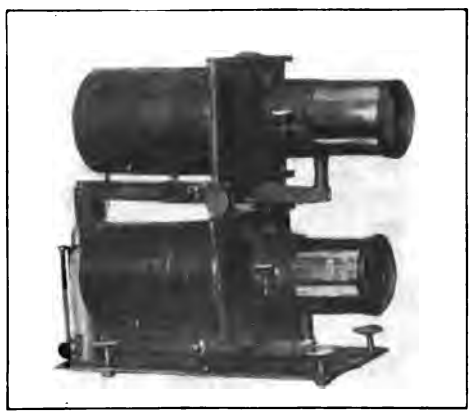
The lantern is not cumbersome in shape or size. It has two projectors, which enable the operator to get graduated light effects that are impossible in the old style instruments. Its "cold" light is obtained simply by the use of an intermittent current of electricity. And so simple are its requirements that its small bulb, with metallic filament, may be supplied with current either from the ordinary house-supply or from a portable battery.

Most important is the apparatus which has been devised to accomplish the interruption of the current in such periods as to give the "cold" result. The intermittent current causes pulsations in the thread of the bulb, so that the light is broken up into a multitude of swift successive flashes, as it were, instead of

being produced in a steady glow. Periods of luminosity and of rest succeed each other with such rapidity that the eye cannot detect the break between the flashes. That is, the periods of rest make practically no impression on the eye, and the effect is that of a continuous light. Nevertheless the intervals of rest are sufficient to enable the heat generated to be dissipated. The result is that the bulb, while lighted, remains as cold as a windowpane, and in spite of the fact that the current may be one of abnormal intensity.

ELECTRICITY FORMS THE BASIS OF THE NEW LIGHT MACHINE.

Not only safety but cheapness is obtained at one and the same time, in the manufacture of this contrivance. For experimental purposes any little motor that will cost a dollar at any electrical shop, will do the work. It is only necessary to mark four longitudinal lines on the shaft, equidistant from one another, with strips of gum or some other nonconducting substance on them, and to place a thin sheet of copper, connected with one of the poles of the battery, so that it will bear on the shaft, to complete the apparatus. The revolving of the gummed shaft under the copper "brush" will give the interrupted current.



M. DUSSAUD'S MAGIC LANTERN WHICH DOES ITS WORK WHILE HEAT IS DISSIPATED AS RAPIDLY AS IT IS GENERATED.

In the application of his light to the cinematograph, M. Dussaud not only eliminates danger of overheating, but he expects greatly to reduce the troublesome quivering that detracts so much now from the pleasure of watching the moving pictures. While the device with which he hopes to accomplish this has not yet been perfected, it involves the use of two projectors, as in the magic lantern, and two bands of film instead of one. By means of nicely adjusted commutators fixed on the revolving part of the machine, it is aimed to have one image moving into position in its projector at the instant that the preceding image is being transferred to the screen from the other projector—on the same principle that so-called dissolving views are now produced with the stereopticon. Thus the screen would be always lighted, or the periods between flashes would be so brief—so infinitesimal—that they would not be perceived by the observer. But M. Dussaud will not talk about this yet. He merely smiles and says it is coming. He is satisfied to say little and do much, as what he has already done, without preliminary noise, demonstrates. The era of perfecting inventions is evidently here.

INSCRIPTION ROCK, NEW MEXICO, WHICH BEARS SPANISH INSCRIPTIONS ANTEDATING THE FOUNDING OF JAMESTOWN.

OLDEST MONUMENT BECOMES THE NEWEST

By

R. B. FRAMPTON

FOURTEEN years before the Pilgrims landed on Plymouth Rock, Juan de Onate, a Spanish explorer, passed along the trail from Zuni to Acoma, in western New Mexico, and stopped over night at a camping place where there was a spring of good drinking water, at the foot of a small mountain of rather striking aspect, rugged and pinnacled.

The Spaniard was returning from a journey to the head of the Gulf of California, which he was the first white man to visit. Before leaving the camping place, he cut with his sword, or possibly with a knife, an inscription in the smooth and soft sandstone of the pinnacled rock, which read:

"Passed by here, Juan de Onate, from the discovery of the South Sea, April 16, 1606."

It will be remembered that the early Spaniards gave to the South Pacific the name of South Sea.

Thus, as above recited, was the first writing made, within historic times, on

INSCRIPTION ROCK IS SPLIT BY A DEEP CANYON.

what is known today as Inscription Rock. The latter, about two hundred feet high, is situated thirty-five miles east of the ancient Indian pueblo of Zuni, and on top of it are two ruined towns of prehistoric age, which are said by the Zuni to have been inhabited by their ancestors.

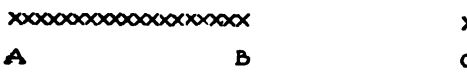
When it is considered that the date of Onate's visit was one year before the founding of Jamestown in Virginia, a vivid notion is obtained of the time that has elapsed since the inscription above quoted was made. The explorer seems to have started the habit of cutting autograph records on the rock, and, as shown by the writings it bears, many persons, both distinguished and otherwise, passing in subsequent years along the trail between Acoma and Zuni, contributed their names and (as a rule) accompanying remarks, the latter describing their errands.

These writings have given to the rock a very important historical value; and their preservation is deemed of so much consequence that President Taft recently issued a proclamation giving formal recognition to the little mountain as a national monument, and forbidding interference with it. Undoubtedly the Indians had made writings of their own in the soft sandstone long before the first white men were seen in that part of the world. In fact, Juan de Onate's own inscription was written over a prehistoric aboriginal "pictograph."

TRANSLATED: "PASSED BY HERE, JUAN DE ONATE, FROM THE DISCOVERY OF THE SOUTH SEA, APRIL 16, 1606."
This, the earliest of the Spanish inscriptions, is written over a still more ancient Indian pictograph.

QUEER THINGS ABOUT THE MOON

WHEN the moon is rising or setting it looks much larger than when directly in the zenith. At such times the moon is several thousands miles farther away from the earth and therefore by all the rules of natural law apparently should be smaller rather than larger. Of course, no one imagines that the earth's satellite actually increases or decreases in volume. The reason for this apparent growth in volume is a so-called "optical illusion," and it illustrates very forcibly a phase of the inability of the mind of man to reason against previous impressions, erroneous or otherwise. The following diagram explains this illusion very clearly:



It will be seen that the distance between A and B appears longer than that between B and C, whereas they are of exactly the same length. It is on account of the many objects between A and B that they appear farther apart than B and C. It is just so with the moon when it is on the horizon. To prove this, look at the moon through a small cylinder of paper and it will at once appear at its natural size. There are no intermediate objects to give an appearance of increased distance. But when we observe the moon on the horizon without the aid of the cylinder, the objects between make it seem farther away, and the mind unconsciously reasons that this being so, it must necessarily be larger in order to see it. No matter how many times we may try this experiment, the eye is always deceived, which shows that the mind cannot be controlled on this point.

Most people when asked how large the moon appears to them will say anywhere from the size of a plate to a wash bowl. But by holding a small coin at arm's length between the eye and the moon it will be seen that the former entirely conceals the latter. Consequently the moon cannot actually look larger to us than the coin; but we think so as the result of another optical illusion.

There are many other interesting things about the moon that would appear peculiar to us if we could visit there. The days and nights are each two weeks long, though, of course, this would not seem strange to dwellers of our own arctic regions. It is believed that the moon has no atmosphere and its heat is radiated into space almost as soon as it comes from the sun. For this reason it is the coldest of all the planets, the temperature never going above zero, and at night it is two hundred below. The absence of atmosphere makes diffused light impossible, so that it is probable if a person stepped into the shadow of some object he would immediately become invisible. This lack of atmosphere would also prevent any sound from being heard on the moon, because of no medium to carry it.

The mass of the moon being so small in comparison with that of our earth, the force of gravity is correspondingly small, and a man's ordinary step would be almost twenty feet. Supposing that two of our baseball teams were playing a game there, the outfielders would have to be at least a mile from the home plate if they expected to catch an ordinary batted ball. The weight of all objects on the moon would be about one-sixth what they are here, so that a hundred and fifty-pound man would tip the scales at about twenty-five pounds.

In going around the earth, the moon revolves upon its own axis exactly once, and for this reason we people on the earth have seen only one side of it. There is no way of obtaining positive information of the appearance of the other side, although there is no reason to think that it differs radically from the one we see. Probably there are mountains on this invisible side and they may possibly be even higher than the ones we may view, which are considerably higher than our own, many of them reaching seven miles and over. But a man could climb to the top of such a peak with much greater ease and speed than he could scale one of half that height on earth.

Well, Well!

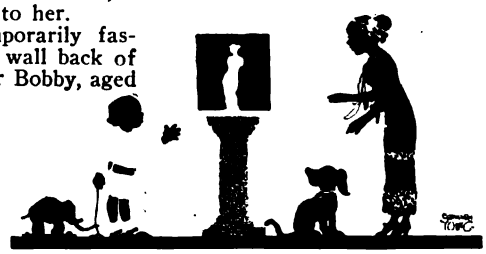
MARY—"And they found her walking the streets in her underwear."

ALICE—"A somnambulist, of course."

MARY—"No, simply a woman with no one in the house to button her up."—*Harper's Bazar.*

A New One on Venus

MARY, an older sister, had spent the morning shopping in town. Among her purchases was a square of dark red velvet which she intended to use as a background for a beautiful little statue of Venus de Milo, which had recently been presented to her.



Just as she had temporarily fastened the velvet on the wall back of Venus, her small brother Bobby, aged five, walked into her room.

"Well, Bobby," said Mary, "how do you like my Venus de Milo? Would you leave the velvet there?"

Bobby looked thoughtful for a moment or so and then replied, "No, Mary, I wouldn't. I'd take it down and w'ap it awound her!"—*Lippincott's.*

Enough Said

CRITICISM such as was heard in the lobby of a theater the other night at the end of the play counts.

The critic was an old gentleman. His criticism, which was for his wife's ears alone, consisted of these words:

"Well, you would come!"—*St. Louis Globe-Democrat.*

Man's Sphere

"WHERE," asked the female-suffrage orator, "would man be today were it not for woman?"

She paused a moment and looked round the hall.

"I repeat," she said, "where would man be today if not for woman?"

"He'd be in the Garden of Eden eating strawberries," answered a masculine voice from the gallery.—*Tit-Bits.*

Unexampled Courage

HE was the small son of a bishop, and his mother was teaching him the meaning of courage.

"Supposing," she said, "there were twelve boys in one bedroom, and eleven got into bed at once, while the other knelt down to say his prayers, that boy would show true courage."

"Oh!" said the young hopeful. "I know something that would be more courageous than that! Supposing there were twelve bishops in one bedroom, and one got into bed without saying his prayers!"—*Truth Seeker.*

Very Wise

"THE first thing I do every morning is to tell my wife that she looks younger and more beautiful every day."

"Doesn't she ever suspect that you are lying?"

"Oh, yes; she knows it: but it keeps her from starting in to find fault with me, just the same."—*Chicago Record-Herald.*

Two Views

SAYS the Reverend Jabez McCotton:
"The waltz of the devil's begotten."
Said Jones to Miss Bly:
"Never mind the old guy;
To the pure almost everything's rotten."

—*James Montgomery Flagg.*

Remarkable

SHE had engaged a maid recently from the country, and was now employed in showing her newly acquired treasure over the house and enlightening her in regard to various duties, etc. At last they reached the best room. "These," said the mistress of the house, pausing before an extensive row of masculine portraits; "these are very valuable, and you must be very careful when dusting. They are 'old masters.'" Mary's jaw dropped, and a look of intense wonder overspread her rubicund face.

"Lor', mum," she gasped, gazing with bulging eyes on the face of her new employer; "lor', mum, who'd ever 'ave thought you'd been married all these times!"

Strange

"I SUPPOSE you find living less expensive since you took to gathering your own mushrooms?"

"A little," replied Mr. Growcher. "We don't save anything on the mushrooms, but all our friends have quit accepting invitations to dinner."—*Washington Star.*

Oh, Yes

MR. GILBERT K. CHESTERTON recently mentioned an English spinster lady who said, as she watched a great actress writhing about the floor as Cleopatra, "How different from the home life of our late dear queen!"—*San Francisco Argonaut.*

A Good Mixer

"BIXBY is a good mixer, isn't he?"

"You're right he is. I saw him passing his individual sanitary cup around in the crowd yesterday."—*Cleveland Plain Dealer.*

Doesn't Sound Right, Somehow

MR. COOPAH—"Could you lemme look in yo' dictionary a minute, kuhnel! Jest want t' find a couple of words to add to mah lodge-office title what Ah was elected to last night. They dun chose me Grand High Most Worthy Exalted Imperial Plenipotentiary, but it strikes me dat sounds jes' a little bit cheap!"—*Puck.*

No Fun

IMPECUNIOUS LOVER—"Be mine, Amanda, and you will be treated like an angel."

WEALTHY MAIDEN—"Yes, I suppose so. Nothing to eat, and less to wear. No, thank you."—*Tit-Bits.*

Kindly Advice

A COLORED man was brought before a police judge charged with stealing chickens. He pleaded guilty, and received sentence, when the judge asked how it was he managed to lift those chickens right under the window of the owner's house when there was a dog in the yard.

"Hit wouldn't be of no use, Judge," said the man, "to try to 'splain dis thing to you all. Ef you was to try it you like as not would get yer hide full o' shot an' get no chickens, nuther. Ef you want to engage in any rascality, Judge, yo' better stick to de bench, whar yo' am familiar."—*Zion's Advocate.*

Very Thoughtful Remark

THE late Fitzhugh Lee was a loyal Virginian and would see this prolific Mother of Presidents deposed by no one, so the choice of him to introduce Grover Cleveland, who was to make an address at the historic University of Virginia, resulted in some mirth.

"Mr. President," he began graciously, "we are honored in welcoming you to Virginia today, both as a loyal democrat and as the President of the United States. 'Tis long since we have had a president with us." Then, fearing such adulation might turn Mr. Cleveland's head, he warmed to his real subject and added, to the delight of his audience: "But the time has been, suh, when we could go out on this very old rotunda porch and holler, 'Mr. President?' and the woods would be full of them!"

POPULAR · SCIENCE & MECHANICS SUPPLEMENT ·

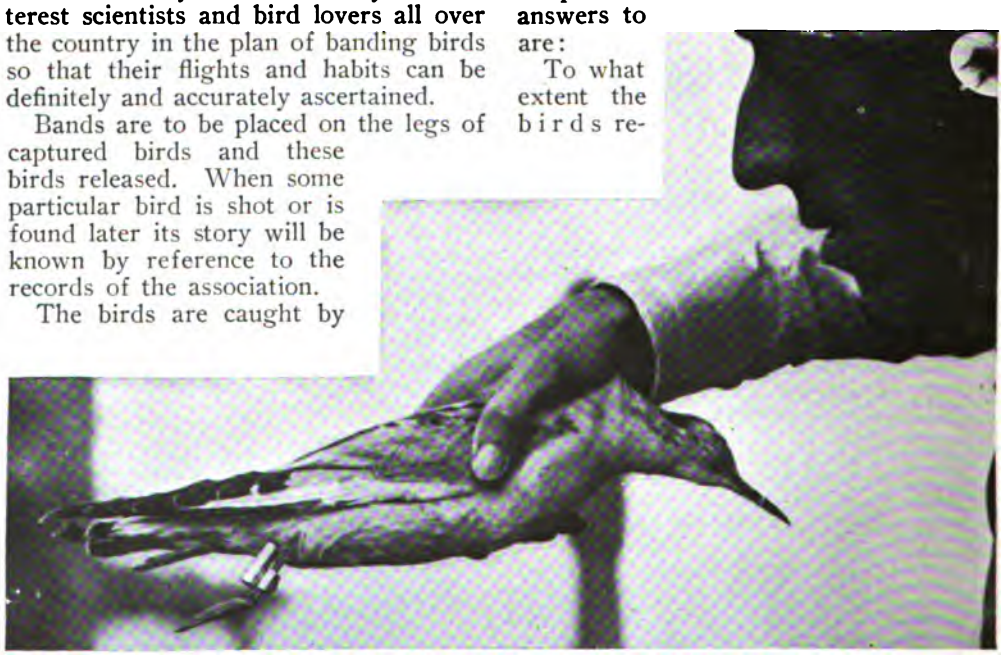
BANDS TO SOLVE BIRD SECRETS

WITH a view to getting at the right solution of many problems of bird life the Bird Banding Association of America has just been formed in New York. The object of the society is to interest scientists and bird lovers all over the country in the plan of banding birds so that their flights and habits can be definitely and accurately ascertained.

Bands are to be placed on the legs of captured birds and these birds released. When some particular bird is shot or is found later its story will be known by reference to the records of the association.

The birds are caught by trapping. It is expected that when the ideas of the association are given more publicity trappers will be found all over the country catching feathered specimens and marking them for future identification by means of the little bands. Some of the questions that the plan is expected to provide answers to are:

To what extent the birds re-



HOW LARGE BIRDS ARE BANDED IN ORDER THAT A RECORD OF THEIR FLIGHTS MAY BE KEPT.

HOW THE INHABITANTS OF CHINATOWN, SAN FRANCISCO, PARADED THROUGH THE STREETS WHEN THE NEWS REACHED THEM THAT A REPUBLIC HAD BEEN PROCLAIMED IN THEIR NATIVE LAND.

turn year after year to their previous nesting place? How far from their birthplace will birds be found nesting? In cases where an identical nest is occupied in successive seasons, how is the tenancy determined? Do birds reared in distinctive nesting sites themselves favor a similar site? In migration, how far and in what direction do individual birds travel? Do migrants travel by definite routes, and if so what is the nature of these routes? Do birds have definite winter quarters which they seek each year? To what extent are males and females, young and old separated while migrating and in winter quarters? What relation do the winter quarters of the northerly-breeding members of a species bear to the southerly-breeding members? To what age do wild birds live?

HOW THE BAND APPEARS ON THE BIRD WHEN READY FOR FLIGHT.

Some interesting results have already been obtained. A robin banded in an orchard at Kingston, R. I., by one of the investigators working alone, before the formation of the national association, was shot several months later at the same place, showing that although the robin had migrated it had returned to its original nesting place. A bird banded at Minot, Mass., was found 55 days later at a point 35 miles away. Another, tagged in Maine, had traveled 120 miles from the scene of the banding in 65 days. An interesting point settled so far is that the young birds disperse as soon as they can get away from the nests and travel mostly in a

BANQUET THAT WAS HELD IN THE MAIN STREET OF WACO, TEXAS.
Twelve hundred people were seated.

AN AIR PROPELLER AS MOTIVE POWER FOR A BOAT.
This is the idea of a French inventor. The tests on the Seine have proved a success. The illustration shows the propeller attached to the motor.

northerly direction, no doubt through some instinct.

CITY'S NOVEL STREET BANQUET

BANQUETS have been held in all kinds of places—in tunnels, on mountain-tops, in cellars, stables, and in the open fields; but for the first time on record an elaborate dinner has been given in the public streets of a city.

This interesting banquet took place at Waco, Texas. The object of the dinner was to celebrate the erection in the city of an enormously tall life insurance building and the bringing into the city of the rails of one of the big trunk lines.

The banquet took place at night, and was held in the city's principal thoroughfare. Four lines of banqueting tables stretched for a distance of 370 feet, and over 1,200 people sat down. Crowds watched the event from the pavements and windows of the neighboring buildings. The dinner was begun at 9 o'clock.

DR. MARY WALKER, FAMOUS ADVOCATE OF A MASCULINE GARB FOR WOMEN.
She served as a surgeon through the Civil War. She adopted men's clothing at that time for the sake of convenience. She lives at Oswego, N. Y.

ST. PATRICK'S CATHEDRAL, N. Y., ILLUMINATED WITH ELECTRICITY.
This was on the return of Cardinal Farley from Rome, where he had just received the red cap of his high ecclesiastical office.

PUSHBALL'S GROWING POPULARITY

PUSHBALL has been coming to the front as a college sport. If someone could invent a pushball that could be made at a reasonable cost the game would be still more popular. The enormous cost of the pushball has made it possible for only a very few to own the balls, and they have been rented out at a high price to those wanting to use them. The pushball is six feet in diameter and costs $300. It was difficult to obtain any information concerning the manufacture for the reason that so few firms make them, but these facts were gathered by diligent search:

The outside covering of a pushball is made of a cowhide leather that is im-

PUSHBALL—A POPULAR BUT EXPENSIVE SPORT AT AMERICAN COLLEGES.
A good ball costs three hundred dollars.

A Comparison of Hindu and American Methods of Handling Lumber.
In the background is shown an electrical crane as used by a lumber company in California.

ported from England. This covering is composed of twenty strips which are sewed together by hand. Each of these strips is between nine and ten feet long or half the circumference of the ball. The strips are widest in the middle, tapering uniformly to points at either end, at the poles of the ball, where they are further secured by leather caps sewed on. To get the leather needed for a pushball it is necessary to cut up five or six hides, which makes the cost of the cover very high. It takes two men the better part of a week to sew this material together.

Huge Brams of Wood Are Pushed Along the Ground by the Powerful Beast.

The bladder for the ball is made of the best rubber, which is cut into strips and cemented together in such shape that it will form a globe fitting the leather covering when inflated. The leather covering is practically indestructible. The very best rubber bladder may give out in two or three years. A new bladder costs $150. A large cylinder foot pump suitable for inflating this mighty ball costs $10.00. "Scotty" at the University of Pennsylvania tried hand inflation once, but found it took an entire morning of hard work to inflate the ball. Since then he has had it done at a neighboring garage with an automobile pump.

The game is played on a field with a goal at each end, each team trying to push the ball through the opponent's goal. It is sometimes used to get baseball teams in condition during the early days. The game is played in Europe, both in England and on the continent.

THE AMERICAN ELECTRICAL DEVICE SWINGS A NEAT LITTLE PILE AT A TIME, WHILE HIS MAJESTY, THE ELEPHANT, DRAGS A HUGE TIMBER HELD IN THE GRASP OF HIS TRUNK.

The game is said to have originated in America. The first pushball was made in Newton, Mass., in 1894. This ball had a covering of leather shaped on a wooden form built for the purpose. Four big hides were required to supply the leather material, which was cut to form six zones which were put together with belting hooks. The bladder was made of rubber cloth cut in sections and cemented together. The materials for this ball cost about $175.

AN ELEPHANT BEING QUIETLY TRANSPORTED ACROSS A STREAM ON A RAFT TO THE WORKYARD.

A Fair Lady Who Braves the Wilds.

Mrs. Herschel Parker, wife of the explorer who climbed Mount McKinley, the loftiest peak in North America. This peak, which is over 20,000 feet high, had defied the efforts of hardy and undaunted explorers for many years. Mrs. Parker ventures into the wilds with the same fearless confidence as does her husband.

The Auto Sphere.

This is a novel form of motor boat which is propelled by the revolution of an outer casing on which is a series of projecting blades. Its motor is of 40 horsepower and it travels at the rate of 30 miles an hour. It is a European invention.

ANOTHER INSTANCE OF MUCH DISHONESTY UNCOVERED.

Here is a pile of "short" measures and fake weights piled up in the City Hall courtyard, Cincinnati, just before they were destroyed by the two inspectors. The owners were heavily fined.

THE MOHAMMEDAN POPULATION OF DELHI, INDIA, GREETING KING GEORGE AND OFFERING PRAYERS FOR HIM.

CONTRAST THE NATURAL DIGNITY AND IMPRESSIVENESS OF THE SCENE ABOVE WITH THE ABSURDLY BURLESQUE FIGURE GEORGE AND HIS QUEEN MARY CUT ON THAT OCCASION.

THE TORPEDO BOAT DESTROYER *Warrington* WHICH MET WITH AN EXTRAORDINARY ACCIDENT DURING A STORM OFF CAPE HATTERAS.

In the blackness of the night she was rammed by an unknown craft, who took away 25 feet of her stern, along with the steering gear, a three-inch gun, and one propeller and shaft; her remaining propeller-struts and shafting were so badly broken that they had to be scrapped.

THE MOST TERRIBLE CONCENTRATION OF POWER ACHIEVED BY MAN IN A WAR VESSEL SINCE THE BEGINNING OF THE WORLD.

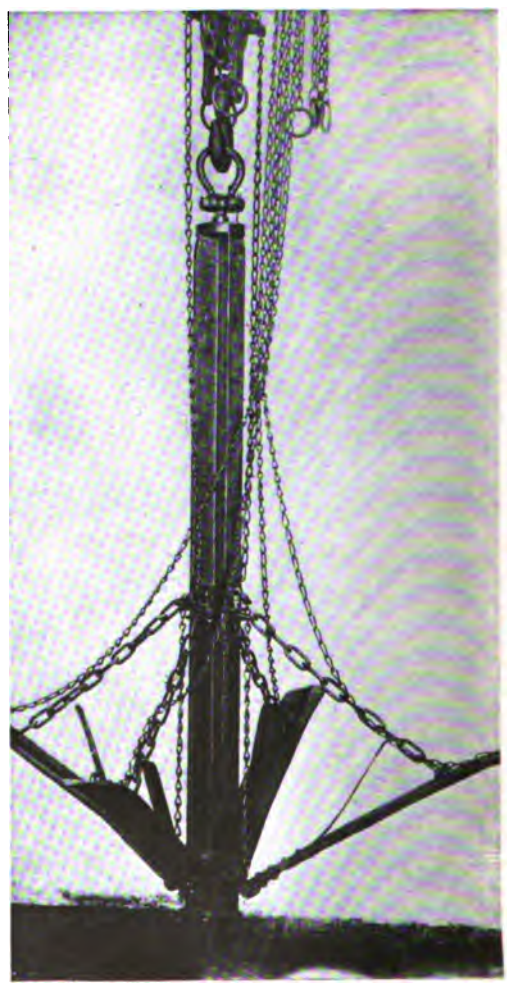
The British battle cruiser *Lion*. The contract calls for a speed of not less than 32 knots. Her turbines can develop 70,000 horsepower. Her guns could wreck a city at 20 miles.

THE "PAGODA" AS IT APPEARS FROM THE REAR.
It presents a distinctly foreign appearance.

THE APPROACH TO THE "PAGODA."
Concession is made to American ideas of comfort in the heavy brick chimney, which draws the smoke from hospitable open fireplaces.

HOME BUILT LIKE A PAGODA

IT is appropriate that California which has such a large Oriental population should be able to boast of a charming home built in a style derived from Chinese and Japanese architecture. It is built upon a very precipitous lot in the outskirts of Los Angeles and consists of two enclosed stories and a third which is merely screened, thus forming an outdoor bedroom. Japanese ideas have been utilized in the curved or arching lines of the footbridge which leads to the upper veranda from the garden. The roof is built upon the Chinese pagoda style.



AN ANCHOR FOR AIRSHIPS.
The blades which hold the anchor in the soil are set or released by means of the chains operated by the aviator above.

RUSHING CONCRETE FAST

IN recent construction work in the La Salle street tunnel under the Chicago river a new mixing and conveying device was put in use which mixed the concrete and conveyed it to the point where it was laid, by compressed air, at the rate of 35 feet a second.

The material was dumped in wheelbarrow loads in a dry condition, into a hopper at the top, and water added. A valve was then opened and the mass allowed to drop into the cylinder below where it was whirled about by a stream of compressed air. This partially mixed the material and as soon as it reached the elbow at the base of the machine a jet of compressed air entered at the rate of 1,000 to 2,000 feet per second. This drove the mixture forward through the conveying pipe at the rate of 30 to 40 feet per second and mixed it thoroughly so

WHERE SOME OF OUR CORK COMES FROM.
One of the big cork oaks of Spain. Cork is, in reality, dead tissue, filled with air, which renders the substance elastic.

CONCRETE MIXER THAT WAS INSTALLED ON JOB AT THE LA SALLE STREET TUNNEL, CHICAGO.

LOOKING DOWN THE MANHOLE INTO THE TUBE. THE SIX-INCH PIPE AS INSTALLED.

STERILIZING BOTTLES IN WHICH FUNGI ARE TO BE GROWN.

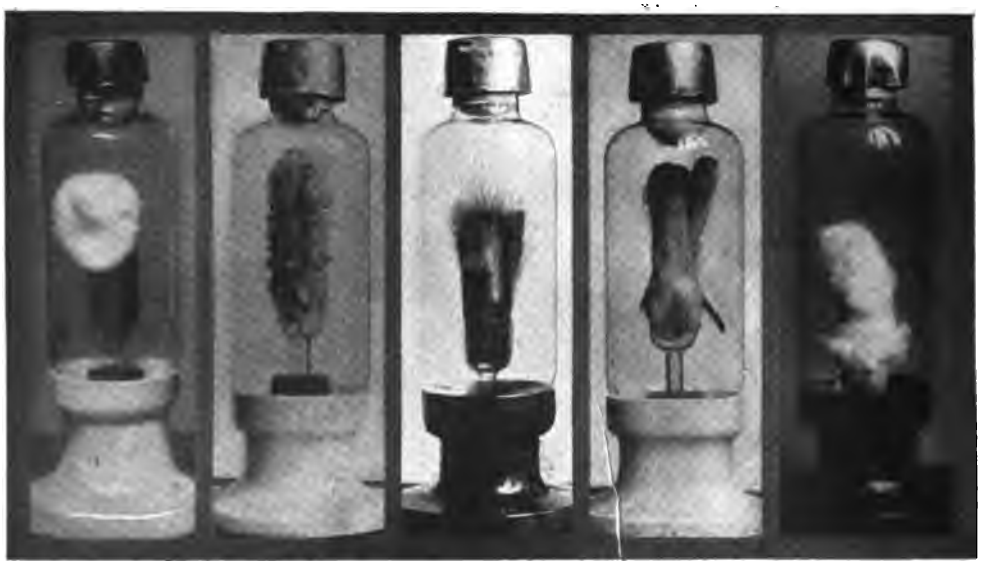
BEAUTIFUL FUNGI GROWTHS.

As beautiful and far more delicate than coral.

Grows thick and soft as fur

that when it reached the end of the conveying pipe it was in prime condition.

The capacity of this mixing cylinder and hopper is from 6 to 24 cubic feet, as conditions require and the conveying pipe may be from 6 to 8 inches in diameter. Through a 6-inch pipe 10 to 15 cubic feet of the mixture was conveyed 315 feet in 10 seconds at the La Salle street tunnel, and other operations have demonstrated that the machine has made equally good records elsewhere.



FUNGI SOWN OR PLANTED ON PIECES OF LICORICE ROOT IN BOTTLES OF BOHEMIAN GLASS.

Looks like a bunch of cotton.

Radiates in a series of tiny bulbs.

Grows like grass.

Develops into fine forms and colors.

Grows especially on Brie cheese.

OBSERVATORY OF THE EBRO, SPAIN, WHERE SCIENTISTS ARE PROVING THAT EVEN EARTHQUAKES AND VOLCANOES ARE NOT INDEPENDENT OF THE SUN.

SUN-AIR-EARTH OBSERVATORY

A NEW idea is gaining ground among scientific men; namely, that solar physics, meteorology, and geophysics have heretofore suffered on account of their isolation from one another, since each probably holds the clue to some of the mysteries of the others. The sun is the ultimate source of all manifestations of energy—or nearly all—in the earth and the air. Long ago it was discovered that the earth's magnetism and the electrical discharges in the atmosphere known as the aurora are sympathetic to variations in solar activity. This discovery led to the suspicion — since become almost a certainty—that terrestrial weather is not the capricious thing it has been reputed to be, but is merely the victim of the caprices of the orb of day. Even earthquakes and volcanic outbursts cannot be wholly independent of the sun's vagaries. We shall know more about the interrelations of all these phenomena by-and-by; meantime it behooves science to seek for coincidences in the records of the three kindred branches of knowledge; and this is what a new Spanish institution—the Observatory of the Ebro, near Tortosa—is doing in a very systematic way.

Continuous observations are made, with the best and latest instruments, of solar, meteorological and telluric phenomena; and they are published monthly in the form of graphic curves and diagrams that enable them to be readily compared. The observations include daily photographic measurements of sun-spots and spectroheliographic observations of the calcium flocculi; the ordinary measurements of meteorology, including the varied observations of atmospheric electricity that have come into vogue in the last few years (ionization, natural Hertzian waves recorded with the

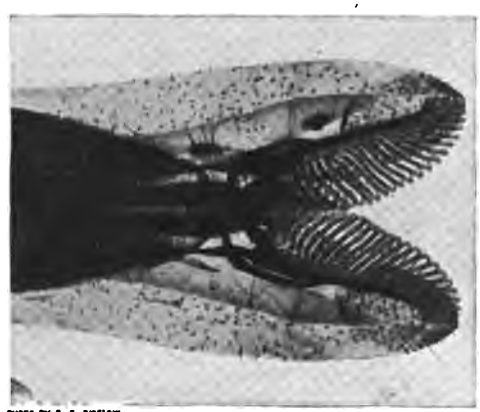


PHOTO BY E. F. BIGELOW.

THE DOUBLE TONGUE OF A DRONE FLY.

This shows its marvelous structure of many tubes for taking up its food. Notice also the nerve cells all over the body of it. This is a remarkable piece of photo-micrography and was probably never excelled by any one in portraying the proboscis of a fly.

ceraunograph, etc.); and the regular registration of terrestrial magnetism, earth currents, and earthquakes.

The new observatory gives us the latest outlook upon our physical environment.

A STUDY IN PHOTOPHYSIOGNOMY.
The face in the middle is normal; that at the left is composed of the right half of this visage repeated; that at the right, of the left half of this visage repeated.

A STUDY IN PHOTOPHYSIOGNOMY

IT is known that the left hemisphere of the brain commands the right side of the body and the right hemisphere the left side. The left brain is therefore the seat of the highest psychic faculties; it is there that the centers of speaking and writing are found. Consequently one may expect that this superiority of the left hemisphere will manifest itself also in the corresponding half of the face which would have an expression more alert and more intelligent than the right half, as shown by the accompanying photographs recently published by Wolf-Czapek. The figure in the middle represents the person photographed in full face under uniform lighting. A vertical line passing through the nose divides the photograph into two parts exactly equal. An arrangement is made in such a way as to obtain with the film two copies, one on the right side and one on the reverse side through the layer of celluloid; they are cut through the middle and one photograph is composed of the two right halves and another of the two left halves. In comparing these photographs it is then seen that the expression is not at all the same, particularly the picture composed of the two left halves, which gives the impression of an intellectual superiority.

TO STUDY LIFE

VOLUMES have been written concerning the wonders of California's vegetation, and many botanists have made a life-study of the flora of that State, without exhausting the subject. The vegetation of the ocean, near the California coast, is no less wonderful than that of the land, and has been, as yet, comparatively little investigated. Still less is known of the lower forms of animal life in the same waters. For the purpose of investigating both animal and vegetable life along the coast of southern California, the United States government has recently established a Biological Station, near La Jolla, a few miles up the coast from San Diego. This is in charge of competent scientists, and is fully equipped with scientific apparatus and appliances for such study.

WHERE VEGETABLE AND ANIMAL LIFE WILL BE STUDIED.
U. S. Government Biological station, near San Diego, Cal.

TRUTHFULNESS OF THE CAMERA

THE illustration was made from a night photograph of one of the principal buildings in Dayton, Ohio.

Having exposed the plate for nearly an hour, the photographer felt certain that the picture would be a perfect one. What was his surprise therefore when upon developing the negative he found what appeared to be the rays of a search light projected from the roof of the building. Its appearance was unexplainable at first as no search light had been used about the building and the phenomenon was attributed to a defect in the plate until it was remembered that the moon had made its appearance during the exposure and floated calmly across the scene.

Upon the street were curious streaks of light resembling the tracks of vehicles, but as the street is paved this explanation seemed unlikely. It was finally decided that the headlights of automobiles had caused the streaks as they passed down the street, and the light from the stand of a popcorn vender who crossed the thoroughfare during the exposure made an irregular streak of light outlining his course.

ELECTROMAGNET FOR EYE DOCTORS

THE use of magnets for extracting iron and steel splinters from the eye is not new but in most of the cases so far, a negative result was obtained on account that in the decisive moment, the magnetic power was not sufficient to pull the piece of iron or steel out of the eye. The electromagnet shown in the accompanying picture has been devised in Germany and proved to be a success in every respect. The principal requirements of such an instrument are the following: (1) The electromagnet must be capable

THE WHITE STREAK SHOWN IN THE MIDDLE RIGHT IS NOT A SEARCH-LIGHT RAY, BUT THE MOON.

POWERFUL ELECTROMAGNET EXTRACTS STEEL SPLINTER FROM THE EYE OF A WORKMAN.

PAINTING ORNAMENTAL PALMS.

We have all heard the phrase "painting the lily" to indicate an excess of artificial beautifying, and this photograph shows an almost literal interpretation of the phrase. In this case it is the ornamental date palms on a Pacific Coast estate which are "beautified" by being trimmed with exceeding symmetry and painted white. The result is more startling than aesthetic.

of developing great tractive force. (2) It must be placed horizontally and its circuit must be made and broken by a pedal. (3) The pole must have a shape adapted to its peculiar function and its dimensions must bear the proper relation to those of the coil.

The first requirement is the most important because lack of this endangers the result of an operation. This magnet has one great advantage over all so far in use, because it permits the physician to have his hands free. The magnet is of the bell form and the working pole is a cone of 90 degrees and this end of the coil is tapered sufficiently to give the operator a clear view of the field up to the tip of the magnet pole. The idle pole is expanded into the form of a bell which covers and protects the greater part of the coil. This construction possesses the additional advantage of restricting the escape of lines of force to one side and diminishing the area of the external magnetic field. The apparatus is mounted on a pillar which is hollow and which contains a switch at the bottom, operated by a pedal. This switch is closed by depressing and thrown open by a spring the moment the foot is raised. A special device protects the contacts from injurious sparking.

The electromagnet is designed for use on direct current circuits of 60 to 300 volts but it can be employed on alternating, uniphase or triphase circuits with the aid of a suitable transformer.

HOW TO STOP A WASP PLAGUE.

Over seventeen thousand wasps were caught in an English grocery store at Hastings, by the simple process of placing a lamp with no chimney on a jam jar in the middle of water. The store was purposely made dark to attract the insects to the light which, being without a chimney, burnt off their wings and caused them to fall into the water. The weight of this lot of wasps was 5¼ pounds with 212 wasps to the ounce.

DID YOU EVER SEE THE TIP OF A HOUSE FLY'S TONGUE? WELL, THIS IS WHAT IT LOOKS LIKE.

This is a remarkably detailed photograph, greatly magnified, of course.

NEXT, THE SEEDLESS TOMATO

"DOTY'S Navel Tomato" promises to be a valuable addition to our list of vegetables, A. J. Doty an enthusiastic amateur plant breeder and horticulturist of Porterville, California, having evolved a tomato of extreme size, which is to the usual vegetable what the navel orange is to the ordinary fruit. The resemblance is borne out by the navel formation at the blossom end of the fruit, where the navel characteristics appear.

In common with the navel orange the new tomato is almost entirely seedless, the usual seed pulp being replaced by solid flesh as shown in the photograph.

Mr. Doty was at work on the tomato for several seasons before he secured the production of them true to type from season to season. The inexplicable characteristic of the fruit is found in the fact that the early tomatoes from the vines contain seeds but after the first few ripen the remaining ones are absolutely without seeds. The value of these tomatoes for packing is obvious.

WAVE MOTOR AT VENICE, CAL., WHICH PUMPS SEA WATER TO A HEIGHT OF FORTY FEET.

DOTY'S SEEDLESS OR NAVEL TOMATO. The round white spot in the foreground, the size of a dollar, gives some idea of the luxuriant growth of the new vegetable.

ELECTRICITY FROM THE WAVES

A WAVE motor is in operation at Venice, California, which pumps sea water to a height of about forty feet, and which it is proposed to use at an early date for generating electricity. This will be done by pumping the water into a storage tank and allowing it to run through the turbines. The motor is built in the form of a ten-foot wooden wheel suspended on a steel shaft and this wheel rests on a frame built out from the pier and standing about twenty feet above the water. Two heavy timbers extend from the wheel down into the water and they are connected a couple of feet below the surface by a wooden plane which receives the force of the

THE PUMPS WHICH LIFT THE SEA WATER.

waves. The advancing waves drive the plane toward the shore, while the receding waves pull it back again, causing the wheel to revolve back and forth on its axle and this motion is transmitted to the gear of four pumps by means of steel wire cables, and the sea water is elevated from the surface to a height of about forty feet through a three inch pipe. As this is merely to demonstrate that the force of the waves can actually deliver the water, the stream is not caught in a tank but allowed to fall back into the ocean, and the spray of falling water can be observed in the photograph of the pump just behind the figure of Mr. Lewis, the inventor.

This seems to be a new principle in wave motors, and although the present model is of crude construction it actually does the work. An improved model will be built within the next few months.

TITAN OF TRAVELING CRANES.
A new coal loading apparatus built in Germany, to be used in Milwaukee.

THE WAY THEY TREAT THE HORSE IN PARIS.
In warm weather each quadruped in service goes forth for his day's work equipped and ornamented with the useful and "catchy" little device shown in the illustration.

TITAN OF TRAVELING CRANES

THIS traveling crane has the reputation of being the largest apparatus for the handling of coal in the world. It was built by a firm in Berlin and will be used by a company in Milwaukee.

The traveling crane, or bridge, is erected upon a revolving tower having a giant arm some 160 feet long connected to it. At the other end of this arm — not plainly visible in the illustration — are two supports extending down to the ground. Thence they run upon a circular track. By this arrangement it is possible for the loading-bridge to reach an astonishing amount of territory.

In the background of the illustration will be seen a long chute running from the top of the tower to the dock below. By means of a moving belt inside of this chute 600 tons of coal are hourly transferred through it, up to the tower, thence out along the bridge, and dumped either into piles or loaded in cars, as the case may be.

In about the center of the long arm will be seen a bucket arrangement which automatically shovels the coal and dumps it. After one pile of coal is of a certain size it automatically finds another place to dump its cargo.

It seems a bit curious—does it not?—that Americans should look abroad for an apparatus of this sort. This seems to indicate, however, that in spite of our boasted mechanical progress Europeans may surpass us in such matters after all.

At any rate Milwaukee, a very enterprising city, seems to be of that opinion.

THIS WOMAN IS VENDING SMALL TURTLES IN THE STREETS OF PARIS.
They are used for soup.

RANCH SCENES IN BRONZE

PRIDE in his cattle and ranches caused Major George W. Littlefield, of Austin, Texas, to have cast upon two solid bronze doors that ornament his new bank and office building in that city panels of scenes taken from actual life upon his Yellow Horse ranch in western Texas. This ranch embraces 300,000 acres of land. The doors were designed and manufactured in New York. Each door weighs 1,300 pounds and cost $4,000. Upon the two upper panels are shown mounted cowboys, dressed in typical picturesque garb. The second panels represent cattle round-up scenes and the two lower ones show herds of the animals quietly grazing. These representative pictures were made from photographs that were taken upon the ranch.

BRONZE DOOR, TYPICAL OF TEXAN LIFE, THAT COST $4,000.

WHOLE UMBRELLA GOES IN BAG

THERE have been numerous umbrellas with folding or telescopic handles and sticks placed upon the market, but it has remained for a young Chicago inventor, Armand C. Pfaff, to perfect one wherein not only the stick, but the cover and ribs may be reduced to such a small compass that the entire umbrella when closed can easily be placed in an ordinary hand bag. Among the other advantages claimed for it is an improved means for automatically raising the cover, when desired, with a minimum of effort.

The stick of the umbrella is formed of three sections which telescope into one another, thereby reducing its length to approximately twelve or fourteen inches when the umbrella is closed. The most novel features, however, lie in the manner of constructing the ribs supporting the cover, and the inner braces. The ribs, like the stick, telescope or slide together and when thus shortened are of an equal length to the folded stick. The braces are pivotally connected with the ribs, and instead of moving outward toward the handle, as happens when the ordinary umbrella is closed, slide down toward the tip. Thus ribs, stick and braces are all brought together in a parallel line, forming a compact bundle of a little more than a foot in length.

UMBRELLA PARTIALLY CLOSED. RIBS, BRACES AND STICK ARE ALL REDUCED TO THE SAME LENGTH.

UMBRELLA CLOSED AND PLACED IN AN ORDINARY HAND BAG.

The entire structure weighs no more than an ordinary umbrella, it is comparatively simple and inexpensive to manufacture, embodies few parts and these so arranged that the danger of derangement is reduced to a minimum.

Thus, one may take the umbrella about with him, put the little hand bag under chair or other seat, and be always certain that no unscrupulous individual is making off with the precious rain protector, from hall or cloak room.

It insures one's mental comfort at all times.

THE WHITE BLACKBIRD.
One of the curiosities of albinism among animals. It was killed near Chambers, Nebraska, not long since.

WHITE BLACK BIRD AND WHITE PRAIRIE CHICKEN

HAVE you ever seen a white black bird? To the skeptical on this point we exhibit the accompanying photograph of a white black bird which is one of the curiosities of albinism in animals. This specimen, as well as the white prairie chicken, also pictured here, was shot in the vicinity of Chambers, Neb., recently. Albinism, as this phenomena is called, exists where there is a constitutional absence of coloring matter in the hair, eye, skin or feathers. Animals so affected are called albinos. Albinos have been known among all races and all peoples, hence neither climate nor race is its causative factor. Albinism is also present in the flowers of many if not all plants, white flowers occurring among others of different colors in the same plant. Albinism occurs more frequently among the Arizona Zuni Indians than among other tribes or peoples. The most widely accepted theory is that albinism is due to an arrest of the development of the pigment layers in the embryo.

THE WHITE PRAIRIE CHICKEN SHOT IN THE VICINITY OF CHAMBERS, NEB., RECENTLY.

TREE SEED BY THE TON

THE Forest Service has been collecting tree seed this winter in quantities unprecedented, and one of the methods adopted—the seeds being mainly those of various conifers—is interestingly shown by the accompanying pictures. One of them illustrates the manner of dumping pine cones into a large skeleton box whose sides are covered with wire net. The other shows how the box is made to revolve, in order to shake the seeds out of the cones.

The pine seeds thus separated from the cones fall upon a cloth placed for their reception, and are thus easily gathered up for storage in sacks.

Thus excellent seeds are secured to start new pine growths.

POURING THE PINE CONES, FILLED WITH SEED, INTO THE SEPARATING BOX.

REVOLVING THE BOX TO TO SHAKE THE SEEDS OUT OF THE CONES.

How the Unloader Is Tripped Over the Edge of the Car.

How the Car Unloader Is Operated.
By turning the crank the work is accomplished with despatch and comparative ease.

NEW CAR UNLOADING DEVICE

A NEW car chute, which is a great saver of time and labor in unloading gondola cars, has recently been invented. This chute rests on a framework inside the car while it is being loaded. In order to empty it into the wagon, it is easily raised by a winch on the frame and then tipped to such a position that its contents slide into the wagon.

The frame is entirely separated from the chute, acting merely as a supporting device to hold it, first, while it is being loaded, and later as a dumping device. This framework merely rests on the car across both sides.

When sufficient material has been taken from the car, the frame is tipped and the rear end is allowed to rest on the bottom of the car. This permits the chute being brought down inside and does away with all shoveling over the edge of the car to the wagon. In either of these two positions the dumping action is the same and the amount that the chute is tipped is always easily controlled by the operator.

Elm Tree Tied into Knots.
This tree has two perfect knots tied in it from the main limbs of the trunk. The tree is about six inches in diameter at the base and is nearly twenty feet tall. It is about fifteen years old, and appears to be in good condition.

Wireless for Airships.

WIRELESS FOR AIR-SHIPS

A RECENT invention and improvement in a system of wireless telegraph communication, which will no doubt be adopted by all air-men in the future, has been demonstrated for the second time by Mr. I. Wolff at Cambridge, Mass., with the assistance of the Jonescick Brothers. The experiment proved to be of greater value, and a great improvement over the one attempted some time ago. With this system of connecting the receiving and sending apparatus and with

Replaces the Spade.
The post auger is an implement of recent invention and is coming into general use. It digs a post hole expeditiously.

THE LEAF OF THE SUNDEW.

Here is an interesting example of a device used by a plant to catch its insect food. There is a little sweetness in the center of the leaf and when a fly alights it is caught by the quick turning in of the tentacles. These hold the fly in position until it is digested, that is until actually eaten by the plant.

the aid of the rubber tires, which prevent the escape of the high tension oscillating currents through the frame and wheels, thereby insuring a perfect ground insulation, the experimenters were enabled to communicate for the distance of about 3½ miles without a ground connection. The experiment took place along the banks of the Charles River with Jonescick Brothers at the foot of the Cambridge Bridge and Mr. I. Wolff at the foot of the North Harvard Street Bridge.

TEETH, RESPECTIVELY, OF WALRUS, SAWFISH, SWORDFISH, SPERM WHALE AND ALLIGATOR.

According to the connections of the aerial and the complete set it will be noted that, when sending out the electrical waves, the alternating currents will radiate in every direction and will travel in proportion to the strength and capability of the set in regard to transmission. The system, if adopted by air-men, will give better results high in the air where there is little of atmospheric disturbance and therefore greater and better results can be accomplished. The distance in the air will be three to four times as great with the same set than if used on land.

TRACTION THRESHING MACHINES OF A NEW SORT.

There is a man in Skowhegan, Maine, who has invented a traction threshing machine. The power is a gasoline engine and it is moved about by its own power with the separator which is built on a jigger of the four-wheeled delivery cart style. In moving the threshing machine from place to place it travels at the rate of about four miles per hour. It threshes grain faster than it can possibly be threshed with the old fashioned threshing-machine with horses.

TEETH OF AQUATIC ANIMALS

HERE is an assemblage of the teeth of some aquatic animals—interesting if only for the reason that they are so different.

For instance, the two outside ones are the tusks of a walrus. They are the upper incisor teeth of the beast, and are not intended for chewing, but for defense.

All through creation is found the most astonishing adaptation of teeth to necessity. Thus the mighty ivory lance of the narwhal, ten or twelve feet long and strong and sharp enough to be driven through the side of a ship, is simply the left upper incisor of the creature. Once in a while, by a freak, both upper incisors will be developed in the narwhal, so that it is equipped with two spears instead of one. The female has no lance.

Likewise, the tremendous ivory spear of the swordfish is merely a gigantic tooth developed for fighting purposes.

REMARKABLE KNIFE WORK

A COMPLETE model of the big granite Postoffice Department building at Washington, reaching three feet from its base to the top of the tall tower, the work of Nathan Lipshitz, a local cabinet-maker, is on exhibition at the Postoffice Department Museum. It is made of wood and was fashioned with a penknife. At the rear are miniature mail wagons, just as at the real building, while on all sides are automobiles and other vehicles giving a typical street scene. A marked feature of the model is that the tower is ornamented on its four sides with real clock dials which show the correct time. The work is a faithful reproduction of the department building, even to the electric light poles. The east and west wings are surmounted with poles bearing the national flag. Mr. Lipshitz is said to have spent two years in making the model. It is inclosed in a glass case.

NEW REVOLVING CYLINDER MOTOR FOR AEROPLANES.

MINIATURE WOODEN MODEL OF THE U. S. POSTOFFICE DEPARTMENT BUILDING, WASHINGTON.

NEW REVOLVING CYLINDER MOTOR FOR AEROPLANES

SINCE most of the laurels won by heavier than air flyers have gone to motors of the revolving cylinder type, a new motor, by the world's first builders of that type, an American concern, is of especial interest. The first successful motor of this type was constructed in 1898.

The most interesting improvement found on this motor and perhaps the most important advance made in the construction of aviation motors since the introduction of the revolving cylinder type, is the elimination of the carburetor and employment of injection with a means for absolutely regulating the amount of gasoline injected into each cylinder, and insuring that all cylinders will receive exactly the same mixture. This also makes it possible to do away with the inlet valve, and employ one valve for both inlet and exhaust, as only air is

A BIRD'S CEMETERY IN GERMANY.

This is at the health resort at Beelitze. It is looked after by the patients at the Sanitarium. It often happens that the singing birds of all kinds which fly about the Sanitarium strike against the glass windows with such force that they fall to the ground killed by the impact. The patients bury these birds in a place set apart for the purpose. Every bird has its own grave adorned with some crosses and monuments.

drawn in by the suction stroke of the piston, while the gasoline is sprayed within the cylinder where it is mixed with the charge of air before compression. Having but one valve in the head of the cylinder, it can be made amply large to insure a full charge and a free exhaust.

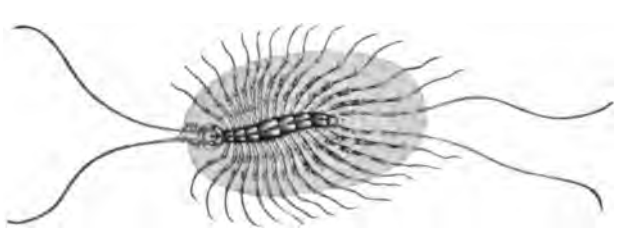
A Scheme That Makes Delivery of Mail Rapid.

In order to relieve the cam controlling the action of all five valves from the heavy load of opening a large valve against the high pressure at the time exhaust takes place, the cylinders are provided with auxiliary exhaust ports, which are uncovered by the piston on its downward stroke. No check valves are required over these auxiliary ports, as on the suction stroke, pure air and not a mixture of gas is drawn in, so what air is drawn in through the auxiliary ports on the suction stroke becomes a part of the explosive mixture in the cylinder, and being a constant quantity does not affect the operation of the motor.

MYRIAPOD THE HOUSEWIFE'S FRIEND

THE average housewife has a particular horror of "centipedes," as she calls the many-legged insects which now and then make their appearance in odd corners of her ménage. They certainly do have a weird and unpleasant appearance.

In some respects, however, she is mistaken about them. To begin with, they are not centipedes at all, properly speaking. Entomologists call them "myriapods," and they are not even related in the slightest degree to the true centipedes.



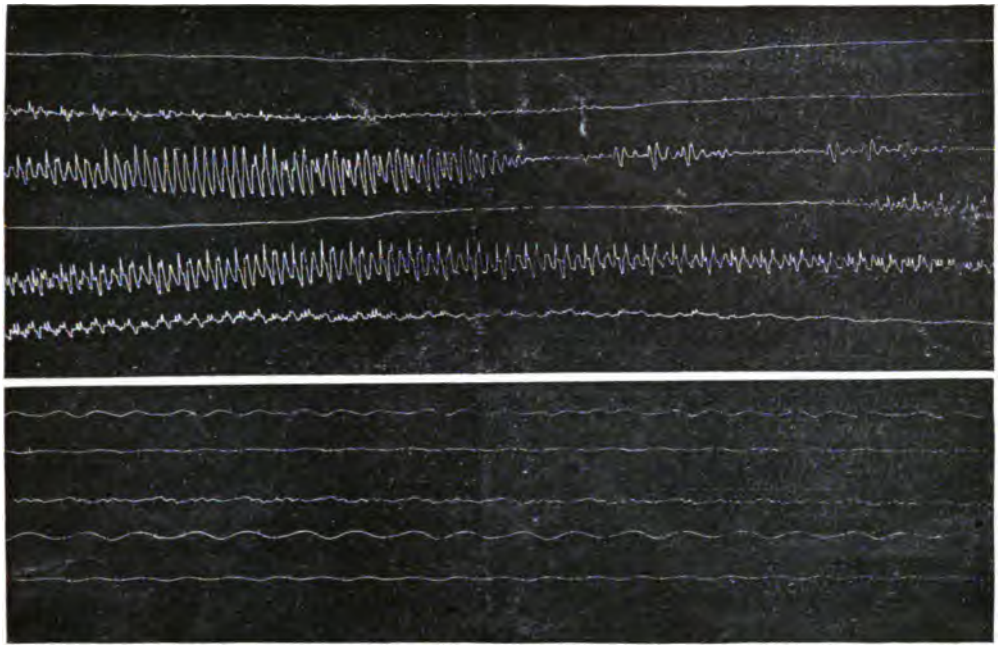
This Horrible Looking Creature Is, in Reality, the Friend of the Housewife.

Secondly, they are not only harmless, but very beneficial, inasmuch as they eat cockroaches, bedbugs, and other noxious insects. They are extremely fragile, so that hardly more than a touch will break them to pieces. If cornered, they are capable of inflicting poisonous bites, but this is a thing that almost never happens.

There is an old wives' notion to the effect that these queer bugs get into people's ears and make trouble. It has just about as much basis in fact as the idea that bats are liable to become entangled in women's hair.

QUICK WAY OF DELIVERING MAIL

THIS photograph shows a very useful and simple device and a great convenience to the rural mail carrier. The idea was taken from a dining room "dumb waiter" by the handy man, who utilized the stump of a tree and a wagon wheel. The top of the stump was cut away leaving only a small "spire" to project up through the hub of the wheel and forming a pivot for the same. Mail boxes were mounted on the wheel by fastening them to the felloe and spokes. The contrivance revolves, so that the carrier never needs to leave his wagon making but one stop to serve 14 patrons. The photograph was made in New Market, Clark county, Indiana, a small village where a post office had been abandoned when rural service began. Oscar Harmon, of Marysville, Ind., is the mail clerk "on the job."



MAKING SOUNDS VISIBLE.
Upper part: lineal representation of words; lower part, lineal representation of the vowels (as pronounced in French) a, e, i, o, ou.

MAKING SOUNDS VISIBLE

MACHINES which have been employed up to the present time for the graphic reproduction of the registrations of the phonograph, require a great deal of time and care in order to make them perfectly correct. The task of the operators, who study the analysis and synthesis of the vowels, has been simplified by the invention of an instrument which rapidly transforms into amplified curves the impressions traced on photographic cylinders.

In a new French method there is placed beside the cutting sapphire a blunt sapphire which holds the frame at a fixed distance by means of a micrometric screw; the displacement of the vibrating plate are therefore independent of the vibrations of the frame and depend exclusively on the voice. Besides, contrary to the usual method, the support of the vibrating plate remains fixed, and it is the cylinder which moves.

WIRELESS STATION OF 100.000 VOLTS.
Marconi telegraphy has become an efficient aid for both commercial and military purposes. The plant shown in the illustration is one of the most powerful in the world and was installed by the French army at a cost of several hundred thousands of dollars at the summit of the Eiffel Tower, about 1,000 feet above the ground. Its great power allows communication with the Marconi Station at Glace Bay in Canada, about 7,500 miles away.
The illustration shows the most important parts of this plant, by means of which the Old and New World can be connected in a few seconds.

When transforming the phonograms into curves the frame is replaced by a metal cork lever of which the relation of the small to the large branch may be varied. This lever remains vertical, while the sapphire fixed to its small branch articulates on it tracing the grooves. On a band of paper covered with black

THIS PLANT, THE SAMUELA, IS SAID TO BE FOUND NOWHERE IN THE WORLD EXCEPT IN THE NEIGHBORHOOD OF SIERRA BLANCA, TEXAS.

smoke measuring 2 inches long traces are obtained. During the transformation into curves the wax cylinder, moved either by hand or by motor, turns much more slowly than at the time of the impression. The result is that the inertia of the lever makes no error in the reproduction.

THE SAMUELA OF TEXAS

ONE of the oddities of the vegetable kingdom is the Samuela, or Sierra Blanca yucca of Southwestern Texas. In addition to the oddity of its appearance, it is peculiar in the extreme narrowness of its geographical distribution.

Botanically, the Sierra Blanca yucca is related to the arborescent yucca or Joshua tree, of the Mojave desert, and to the Spanish bayonet that thrives throughout the semi-arid region of the Southwest. However, in appearance it resembles neither. It grows to a height of from 10 to 20 feet, usually in straight, columnar form, without branches. At the top are a great number of smooth, tapering, pointed, dark-green leaves. As new leaves develop, the old ones die, shrivel, become brown, and turn back along the trunk, which is thus sheathed in a thatch-like covering of recurved leaves.

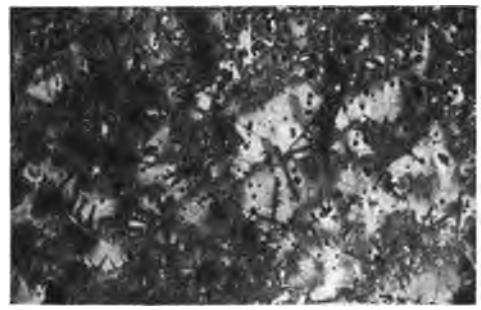
BRIDGE OF WIRE FENCING.

This unique bridge was constructed by a farmer in Calhoun County, Michigan, for the purpose of transporting the milk from his farm to the interurban railroad. By crossing this bridge he reaches the trolley line by walking a few rods, while before it was built it was necessary for him to drive three miles to accomplish the same purpose. The bridge is suspended ten rods across the river and is ten feet above the river in the middle. It is built of woven wire fencing. A strip of fencing covered with boards forms the bottom of the bridge.

POWDERED ALUM ON GLASS

THE frosting of glass may be easily done and very remarkable effects may be secured by viewing these artificial forms under a microscope by the aid of a polariscope. It was a favorite "Oh my" slide of the old time amateur microscopist and many a collection is now adorned by these beautiful specimens of the microscopical art. The microscopists in their magazines vied with one another in their efforts to add to the published list something very good that they had discovered. Each user of the microscope had some favorite crystal for the excellence of which he was ever ready to argue.

But not all of these are beautiful in themselves. Many need the aid of the polariscope to bring out the beauty of color but some crystals are pleasing even when viewed with artificial light by the unaided eye. Among those that have been found the most satisfactory are Epsom salts, tartaric acid and alum. Un-



MADE BY LETTING A SOLUTION OF POWDERED ALUM DRY ON GLASS.

Very effective for ornamentation of show windows and all sorts of chemical designs.

HOUSE-BOAT OF A CHICAGOAN THAT IS PROPELLED BY AUTO POWER.

The auto is run along the grooved runways. The two covered objects in the middle of the deck are jacks to raise the carriage clear of the deck. The rear wheels of the car are connected with the spurred sprocket wheels, to right and left, which are fastened to the paddle wheels.

AN ITALIAN CURIOSITY—A PEAR TREE BEARING SEVEN PEARS ON THE TRUNK.

No leaves grew with this cluster. This tree stands on the land of a farmer near Genoa.

NEW STYLE CANAL LOCK, USED NEAR HAMBURG, GERMANY.

The vessel is being lifted in a trough from the upper to the lower canal locks.

REMARKABLE ACCIDENT ON THE NORTHWESTERN RAILWAY AT WELLESDEN JUNCTION, ENGLAND.
One car mounted another and completely swept away all the upper works.

BATTERY TRUCK CRANE SERVING SHIPS FROM CASTING STORAGE YARD.

doubtedly it is Epsom salts that have the greatest popularity. It is the crystals of this salt that are frequently seen, especially on bar-room windows. Some men make a specialty of going from saloon to saloon to decorate the windows in midsummer with beautiful frost-like forms that make the saloon especially attractive in the sweltering days of July and August. The common custom is to mix Epsom salts with stale beer. It is supposed the action of the beer forces the crystals to adhere closely to the glass.

BATTERY TRUCK CRANE

FOR the quick handling of material about a shop or in unloading cars the small electric truck crane as shown in the illustration has been designed by a well known electrical manufacturing concern, and fills the place that the great shop cranes can not fill because of the comparatively slow operation.

The car upon which the crane is mounted is short and easily turned in small space making the truck especially useful in running about the floor of the shop where material and machines are crowded together.

The storage battery mounted upon the rear of the car furnishes the electric current for operating a motor both for propelling the car and operating the crane. A one ton hoist is used and the truck has a pulling power of two tons so that a train of small cars loaded with material may be taken in tow and unloaded by the crane at any desired point.

Rapid operation is the crane's chief advantage. In recent tests 300 castings aggregating 65,000 pounds were unloaded from a car in five hours, an average of 1 2/10 lifts per minute.

On another occasion sixty-four 800 barrels of plumbago were loaded by the crane in 25 minutes.

In the stock room where heavy material must be handled the crane is found very useful. In a test made recently a number of boxes of bar iron weighing 100 pounds each were to be piled. The crane piled 40 of these boxes in one hour.

The car is equipped with wheels 24 inches in diameter and having a 5-inch face. The crane arm is adjustable to various heights and can be supplied in lengths best suited for the work in hand.

The battery can be charged by the addition of inexpensive apparatus to the equipment of the ordinary power house and the work of charging attended to at night by the watchman.

This device is one of the most convenient and expedient which has ever been invented for such a purpose.

BABY RAFFLE IN PARIS.
The management of a foundling hospital with the consent of the respective authorities decided to play out all the babies, whose parents they were unable to trace. The income of this raffle was divided among the different charity institutions.
This idea is such a good one that its observance could strongly be recommended to all similar hospitals. The government is released of the burden to take care of the little babies and the income of such raffles provides a substantial help to the different charity organizations.

AUTOMATIC NEWSPAPER VENDER AS USED IN LOS ANGELES, CAL.

THE MECHANICAL NEWSBOY

THE raucous cry of the train boy will soon be a thing of the past, when the automatic newspaper venders come into general use. They are now in operation on the great interurban electric trolley system centering in Los Angeles, California, and are a recognized success. As the photograph shows, the automatic newsboy has a large stock, five local papers and one weekly being carried, and although the price of these varies from one to five cents, each is delivered accurately for its own price. A couple of hundred of these machines have already been installed, and a national extension of the system is planned. Not only trains but hotels, apartment houses and news stands, drug stores etc. will be supplied with the new device, which should pay for itself in clerk hire within a short time. In the photograph, a customer is shown receiving a paper, to secure which he had dropped a nickel in the slot, and had pressed down the lever. The invention should prove popular.

EACH LEAF OF THIS PLANT IS SELF-SUFFICING.

LEAVES LIKE SEEDS

THESE leaves are on earth in a pan and, as is readily seen, the edges are sprouting. From this characteristic this plant—the *Byrophyllum calcynum*—derives the name of "live forever." The leaves are dropped on the ground by the parent plant as seeds with most plants would be, and each leaf takes root and grows.

One of the leaves has been purposely turned up in order that the rootlets might be shown.

How the Auto Makes Its Mark

Republican Simplicity Abroad.

Embassador Richard Kerens of St. Louis, standing in the vestibule of the United States Embassy at Vienna, surrounded by his military attache, and a dozen or two assorted footmen and other lackeys in silk stockings and powdered wigs. The photo is an extremely touching example of the Jeffersonian simplicity which seems to prevail in the diplomatic service of these United States.

Heated Smoke Floats Balloon.

This big canvas bag is filled by burning under it kerosene soaked wood. When it has ascended about one thousand feet, the aeronaut, sitting in a trapeze attached to a parachute, cuts loose from the balloon. The parachute opening up lets the aeronaut down easily. Released from his weight the balloon soon topples over, letting out its cloud of hot smoke, and drops to the ground.

HOW THE AUTO MAKES ITS MARK

THIS night view of a city street represents an apparently deserted thoroughfare with a tangle of wheel tracks on one side. In reality it is the picture of a very busy street, with constantly passing automobiles and street cars. The latter left the broad streak of light across the picture, while the network of wheel marks—so they seem—is a record of motor cars with their lights in pairs. Once in a while a car stopped, leaving two little dots of light, and then proceeded, forming the continuous track. Cars going around the first corner are also shown. One of them carried a high headlight, such as the police patrol car uses. Of course the pedestrians made no impression on the film, and the vehicles going away from it would leave only the faint record of the tail lights.

MISS AGNES C. LAUT AMONG THE PUEBLO RUINS OF THE PAINTED DESERT, ARIZONA.

THE MEN WHO MAKE THE MAGAZINE

MISS AGNES C. LAUT is not, literally, one of "The Men Who Make the Magazine." But using the term in its generic sense to include the whole human species, she is entitled to a foremost position in our list. In pursuit of material, she has penetrated far into the fur country to the north, accompanied only by Canadian voyageurs. Equally well she knows the great Southwest.

RENÉ BACHE.

RENE BACHE, making his residence in the city of Washington, is directly in touch with the chiefs of the various bureaus, and all his articles are, therefore, authentic and from first hand.

FORREST CRISSEY.

FORREST CRISSEY is an exponent of opportunities, especially of farming opportunities. From his country home, an hour's ride out of Chicago, he sallies forth—to study and write about conditions—east, south, and west.

CHARLES DILLON, is head of the department of Industrial Journalism, at the Kansas Agricultural College. Of himself he writes to the editors: "I do two things: work in the garden and write about it."

He does both of these things with equal vigor and enthusiasm.

Mr. Dillon realizes the tremendous good that the editor of the country weekly newspaper could do in his community if he had the proper training. He could be a power in the proper transmission of agricultural research to the farmer. That is one of the purposes—though of course only one—of the department of Industrial Journalism.

Mr. Dillon has turned his energies into a department of collegiate instruction which is still very new. It seems rather remarkable that so important a field of education should have been so long neglected as has this.

Mr. Dillon was one of the first to realize that a college is a place where something more than mere culture is to be obtained. He understands it is a place for the learning of practical things as well.

CHARLES DILLON.

DR. WALSH is a vigorous advocate of the prevention rather than the cure of disease. This, he believes, is the true function of the physician. He devotes himself solely to writing. His strong articles in THE TECHNICAL WORLD have stirred up considerable comment. Dr. Walsh has studied extensively abroad, in the great medical schools of Paris, Berlin, and Vienna.

DR. F. C. WALSH.

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Technical World Magazine

HENRY M. HYDE, Editor

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Technical World Magazine should be on the news-stands on the 17th of the month preceding the date of issue. Patrons unable to get the magazine on the 17th will confer a favor by notifying the Circulation Manager. News-stand patrons should instruct their News-dealer to reserve their copy of Technical World, otherwise they are likely to find the magazine "sold out."

TERMS: $1.50 a year; 75 cents for six months; 15 cents a copy. Foreign postage, $1.00 additional; Canadian postage, 50 cents additional. Notice of change of address should be given thirty days in advance to avoid missing a number.

TECHNICAL WORLD COMPANY

Home Office: 58th St. and Drexel Avenue, Chicago Eastern Office: 1702 Flatiron Building, New York

Entered at the Postoffice, Chicago, Ill., as second-class mail matter.

TECHNICAL WORLD MAGAZINE FOR JUNE

GRABBING THE WEST'S LIQUID FUEL

By

WALTER V. WOEHLKE

We have been so busy conserving our forests, our water power, our Alaskan coal fields, that the vast oil area of the West has been staked out by alleged "prospectors," turned over to "developing" companies and the eminent domain of "this liberty-loving, sovereign people" has once more in another direction been exploited for private aggrandizement. Possession of any mineral claim rests upon the *discovery* of mineral. No rights of any kind are acquired under the law prior to such discovery. No one is entitled to a reward for pointing out a haystack as the locus of a lost diamond. California oil "prospectors" squatted upon the haystack—that is, the public domain—did nothing and asked tribute of those willing to search for the jewel. Mr. Woehlke shows in this strong article how both Congress and the Department of the Interior have most signally failed in the performance of their duty.

This is one of the most powerful articles the TECHNICAL WORLD MAGAZINE has printed. It is the June leader.

OTHER GOOD THINGS

Feeling the Pulse of a Skyscraper.
"Blood Will Tell."
The Rise of Rice in Arkansas.
Four Hundred Feet in the Deep.
Raising a Vessel to Sink it Again.
Carp—The Food of Thousands.
Staying Death's Hand.
Mountain Peaks Crash to Earth.
A Handful of Engine.
Repairing Niagara Falls.
Motor-Cycles on the Farm.

TECHNICAL WORLD MAGAZINE

VOL. XVII · MAY · 1912 · NO. 3

WHAT · STEEL · DIVI-

JUDGE ELBERT H. GARY, CHAIRMAN OF THE BOARD OF DIRECTORS OF THE STEEL CORPORATION.
He says the treatment accorded steel employees compares favorably with that of any other line of industry in this country.

THE firm of J. Pierpont Morgan was paid $70,000,000 for its services in organizing the billion dollar Steel Trust—the United States Steel Corporation—in 1901.

As part of the service for which this incredible sum was paid the Morgan firm agreed to the purchase of the property of the Carnegie Steel Company for $420,000,000—about twice the amount for which Mr. Carnegie had agreed to sell the same property one year before. And Mr. Carnegie has never ceased regretting that he was too modest in selling his business for $420,000,000. "I was a fool to sell at the price," he told the Stanley Steel Committee of Congress last fall. "I might have got a hundred million more."

No doubt Mr. Carnegie is right. A hundred million dollars, more or less, was a trifle at that particular time to the iron magnate.

According to a government estimate, the total "water" in the capital stock of the billion dollar trust amounted, all told, to about $600,000,000—more than half its total issue of securities.

During the nine years which followed its organization, the steel trust earned profits of more than a billion dollars.

In 1910, at least 22,000 employees of the Steel Trust worked twelve hours a day for seven days in every week.

More than half of the employees of the Steel Trust earned in 1910 less than $617—or about $50 a month.

Twenty-one per cent. of the employees of the Steel Trust earned in 1910 less than $549 a year—or about $45 a month.

Mr. Carnegie's personal share of the price paid for the Carnegie Steel Company was $207,000,000. It would take an ordinary steel workman, working twelve hours a day and seven days a week and earning $600 a year, just 350,-

DENDS · COST

By Henry M. Hyde

000 years to equal the Laird of Skibo's steel fortune. Ten thousand such workmen would toil for thirty years to raise the same amount.

These figures are taken from various official governmental reports. The figures as to hours of labor and wages are from the report of the Federal Bureau of Labor, made in 1910, and cover only 90,000 of the more than 200,000 total employees of the trust.

This report says:

Working hours were reported for 90,564; of this number 44,993 had a working week of 72 hours or over, which is, in effect, at least a 12-hour day for six days a week. Approximately one-third of all the employees had a regular working week of more than 72 hours, which practically means some work on Sunday. Over 22,000 had a working week of 84 or more hours, which means at least 12 hours every day in the week, including Sunday. Approximately three-fourths of all the employees had a working week of over 60 hours; 11 per cent. of all the employees had a working week of just 60 hours; while only 16 per cent. had a working week of less than 60 hours.

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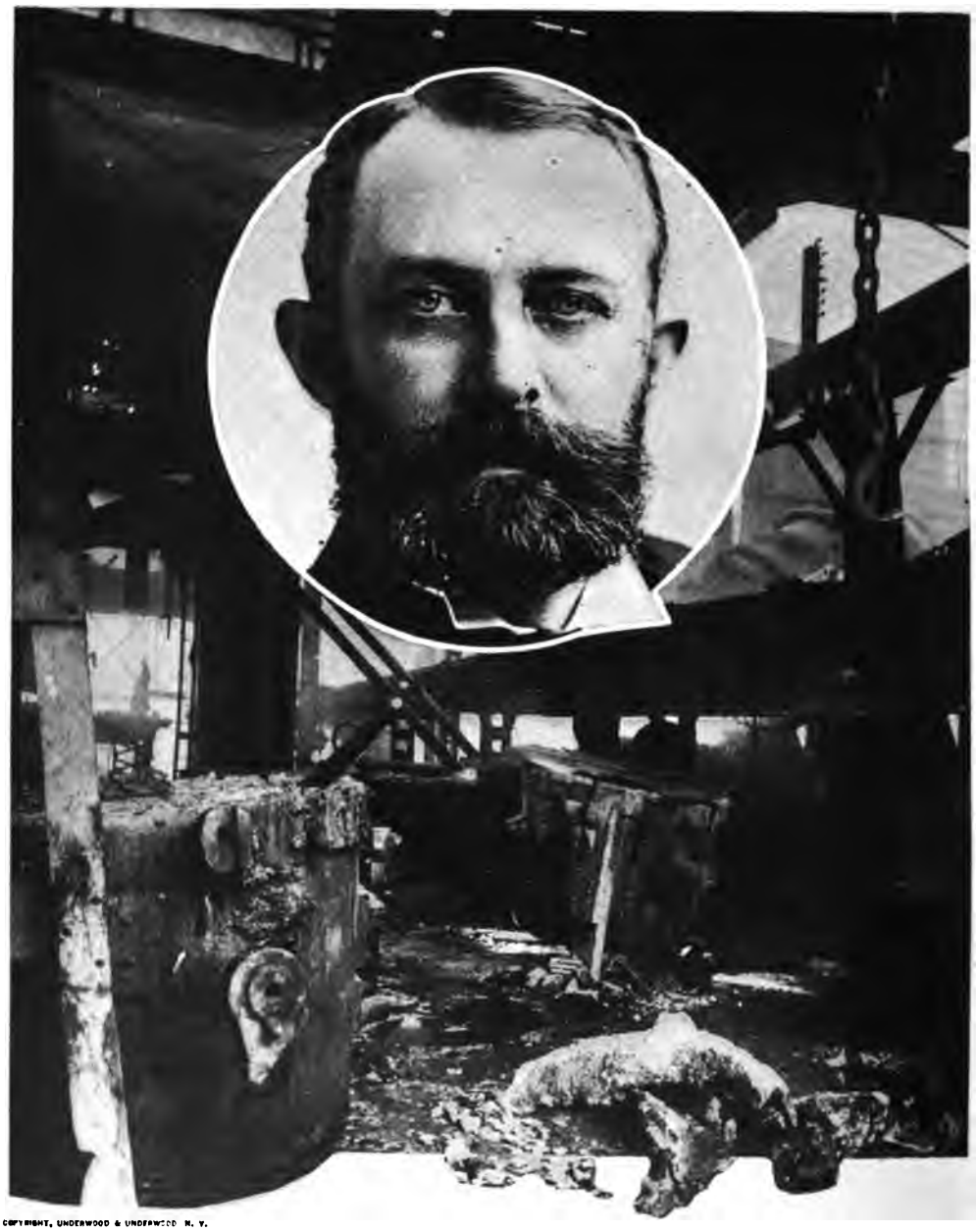
"It is Idle to Rail at Morgan . . . Men Who Know Declare He Has a High Sense of Personal Honor."

To what extent are the payment of $70,000,000 in promoter's profits and the issuance, all told, of $600,000,000 in "watered" securities—on all of which dividends must be earned—responsible for the wage policy of a company which pays to tens of thousands of its employees a less yearly wage than will buy the actual necessities of life for the average family?

To what extent are these facts responsible for making a twelve hour day—and, to a considerable extent, a seven day week—necessary to the successful operation of the trust?



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HENRY C. FRICK, A DOMINATING FIGURE IN THE COKE INDUSTRY.

WHERE IRON BECOMES STEEL.
Within the works at Pittsburg. The room is aglow with the white-hot metal in the converters.

To what extent are the Carnegie libraries and other benefactions actually paid for by men who work twelve hours a day to earn $50 a month?

To what extent will it benefit these men to lower or remove the tariff on steel, so long as dividends must be earned on hundreds of millions of "water?"

In the steel industry—alone among the great industries of the United States—is

there absolutely no recognition of labor unions. The 300,000 workmen of the steel trust are entirely without union organization.

The present situation is the best possible illustration of the work of the most enlightened and most powerful capitalists in the country when they are left with a free hand to deal exactly as they please with their own employees.

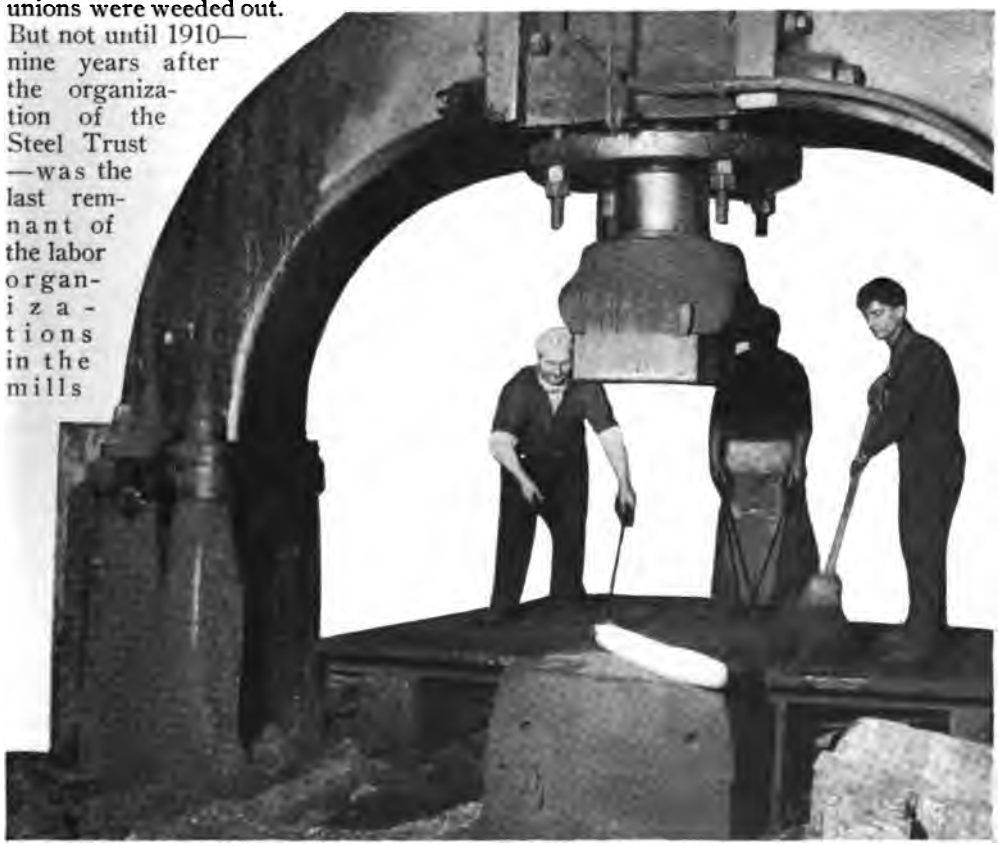
Previous to 1892, the year of the great Homestead strike, iron and steel workers were pretty thoroughly organized into unions. When that strike broke out, the majority of workmen—outside of the blast furnace men—did no work on Sunday. While the twelve hour day was most nearly general, a very large number of men worked ten hours a day and there were hundreds of eight hour jobs.

After the strike of 1892 was won by the Steel mills, more and more of the men were put on a twelve hour basis. Gradually the remaining unions were weeded out. But not until 1910—nine years after the organization of the Steel Trust—was the last remnant of the labor organizations in the mills of the United States Steel Corporation finally destroyed.

It is idle and worse than useless to rail at Morgan and Carnegie. Almost any one of their most violent critics would hail with yelps of delight an opportunity to pick fifty or a hundred million dollars off the corporation plum tree. Men who know Mr. Morgan declare that he has a high sense of personal honor. The little gray Scot has become benignity personified. They simply took advantage of conditions.

Once the steel trust was organized and its tidal wave of securities poured into the public market the real harm was done. What follows is inevitable.

Many processes in iron and steel making are necessarily continuous. The mills cannot be shut down at the end of ten hours and opened again the next morning. They must be operated—as to many departments—for twenty-four hours in



THE BIG HAMMER GIVES THE BILLET ITS SHAPE.

each day, if economy and organization are to gain the largest profits.

Mills running twenty-four hours each day may be manned by two shifts, working twelve hours each, or by three shifts, working eight hours each. With the necessity of earning dividends on an enormous capitalization always before them, the most humane managers can be understood when they insist on working their men twelve, rather than eight hours a day.

These managers themselves feel the stigma which attaches to them and their great industry when the twelve hour day is made continuous for seven days in a week. Nearly two years ago, W. B. Dickson, First Vice-President of the Steel Corporation, called attention to this reproach and, since that time, the steel trust and many of the independent companies have adopted a plan which is intended to give every workman one day's rest out of each week.

POURING THE METAL.

The twelve hour day, however, remains practically universal in the steel mills. And, year by year, as the "speeding up" process continues—the process under which the payment of bonuses for "big production" to superintendents and other bosses, the workmen are more and more severely driven—the strain on the rank and file in the mills grows constantly greater.

The volume on "The Steel Workers" in the Pittsburg Survey, published by the Russell Sage Foundation, says:

"It is not entirely due to the marvelous ingenuity of American engineers that steel production has increased at such a remarkable pace. The speed of the men who man the plants has played its part. Devices to develop it, possibly not bad in themselves, become, in their combination, when there is no restriction in the length of the workday other than the full round of the clock dial, a

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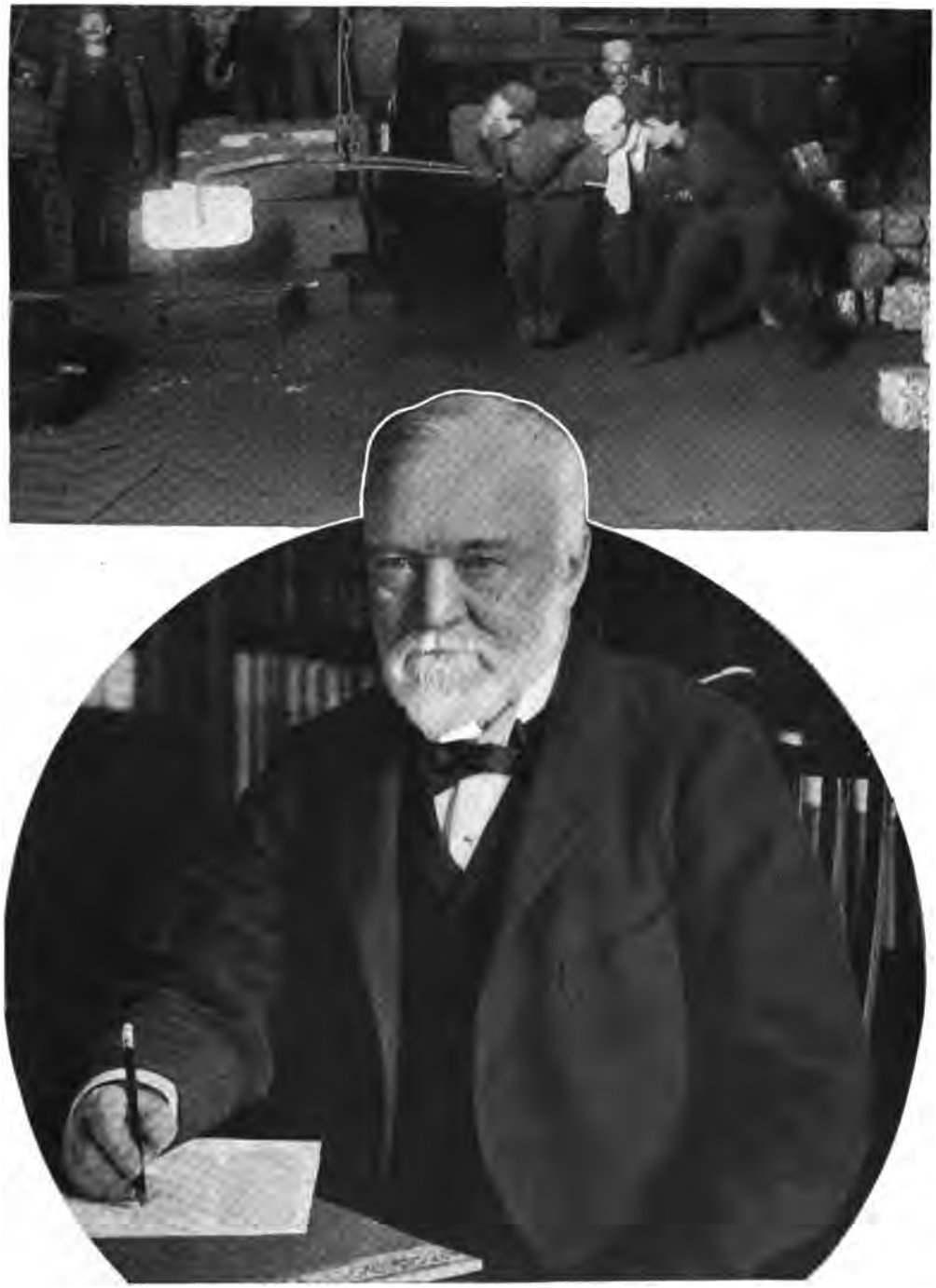
RED-HOT STEEL BEAM DRAWN OUT TO A LENGTH OF NINETY FEET.



MR. CARNEGIE SAYS HE "WAS A FOOL" TO SELL HIS STEEL BUSINESS FOR FOUR HUNDRED AND TWENTY MILLIONS. HE "MIGHT HAVE GOT A HUNDRED MILLION MORE."

schedule of overstrain; and they become, when there is no common organization of the men to balance them and resist encroachment, a system of exploitation.

. . . The result of it all is a system of speeding, unceasing and relentless, seldom equalled in any industry at any time."

According to the same acknowledged authority the Steel Trust employs also regular secret service men whose duty it is to spy on the workmen and to report to their superiors any agitation looking towards the formation of unions or organized protests against the twelve hour day or other working conditions. At various times also successful attempts have been made, under direction of the central office in New York, to dictate the political action of the workmen. In May, 1908, for instance, the Pittsburg Survey reports that the superintendents of the Edgar Thompson plant at Braddock, Pa., were ordered to line up the men in favor of the Penrose candidates for the legislature, the point being made that the first duty of the men was to the Steel Corporation and that the Corporation needed Penrose in the United States Senate.

W. B. Dickson, First Vice-President of the Steel Corporation.

Nearly two years ago he called attention to the stigma which attaches to the working of men a twelve-hour day seven days in the week.

But it must not be taken for granted that the managers of the Steel Trust, having the power entirely in their own hands and not at all hampered by the fear of strikes or labor unions, have no realizing sense of their duty and responsibility towards the men.

Under the direction of Judge Gary, Chairman of the Board of Directors, and his subordinates, many broad-minded and humane policies have been inaugurated. Committees of Safety have been organized to develop the use of safety appliances in the various plants. That work of any kind in the steel mills is recognized as dangerous is shown by the fact that before a visitor is admitted to any of the mills of the Steel Trust, he must sign an agreement releasing the corporation from liability for any damage to his person. In a single year two hundred workmen have been killed in the steel industry in the mills of the Pittsburg district alone and that takes no account of the other hundreds more or less seriously and permanently injured. But in this whole matter of affording better protection to its workmen, it is a pleasure to report that the United States Steel Corporation is taking an aggressive and enlightened interest.

In 1903 the Steel Corporation instituted its so-called "profit sharing" system, under which shares of the preferred stock of the corporation are sold to workmen on the installment plan. The annual offer of stock has been usually oversubscribed by the men. The stock is paid for in ten monthly installments, which are deducted from the wages in amounts fixed in advance by the subscribers. In addition to the regular dividends, paid to all holders of the stock, the men are promised that if they hold the stock for five years and during that time "show a proper interest in the welfare and progress of the Company," they will be paid an extra dividend of $5.00 and to such of them as "the corporation shall find deserving thereof" a still other and larger gift or bonus.

As a result of this sorting process, the 26,399 workmen who originally subscribed for stock in 1903 dwindled to 5,409 when the first extra dividend was paid in 1908.

The feeling is general among the workmen that the stock selling system, with its extra payments, at the will of the Company, to those who are tractable and

obedient, is intended to bring the intelligent and thrifty class more and more under the complete domination of the Company. If a worker, for instance, should protest against the twelve hour day as inhuman and barbarous, it is probable that he would not be considered as taking "a proper interest in the welfare and progress of the Company."

In all its dealings with the men, the company takes the position of a more or less kindly and paternal despot.

IN THE GLOW OF THE MOLTEN STEEL.

Looked at from an unprejudiced standpoint, the spirit among the 300,000 men who work for the Steel Trust seems to be one of sullen restraint and half-fearful, half-angry repression.

"The workingmen of Pittsburg or any other American community could not be roused over night to the point of serious, premeditated, revolutionary violence," says the Pittsburg Survey. "Agitation alone, however persistent, could never accomplish it; but if the treatment that the steel companies are now employing toward their workmen be indefinitely prolonged, it will be hard to predict the ultimate action of the workers. Under such circumstances, if there should ever be a violent outbreak of any sort, the Corporation officials will not need to look far for the cause. Revolutions, however, do not necessarily involve violence. And through either the trade union or the political movement or through some other means, there is bound to be a revolution ere long that shall have as its goal, the restoration of democracy to the Steel workers."

That the officials of the Steel Trust do not view the situation with any such alarm, is shown by the following statement, attributed to Judge Gary, chairman of the Board of Directors of the Corporation:

"The treatment accorded by our Corporation to its employees compares favorably with that of any line of industry in this country or any other country at the present time or any period in the history of the world."

Between the two views, there is a wide divergence of opinion. They can never harmonize. That is impossible in the very nature of things. It would seem to be the duty of every citizen to study the facts and make up his mind which is more nearly correct.

TOWN WHERE TRUSTS DON'T RULE

By

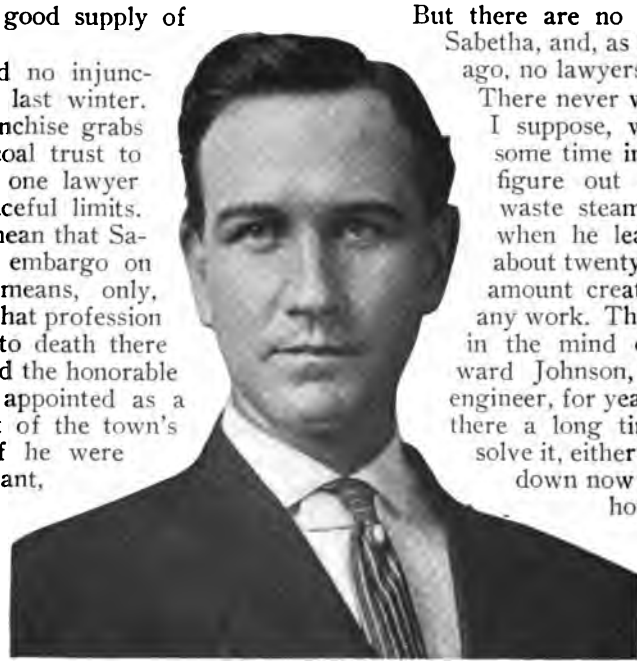
CHARLES DILLON

IT did not take long for Sabetha, Kansas, to build its own public utilities. While the newspapers were printing frosty messages, last winter, about weather thirty degrees below zero, coal shortages, and shivering families, this little town of 2,100 inhabitants, in Nemaha county, was the most comfortable place in the state. It had its own pure water supply; it owned an excellent electric light plant; it had a perfect system of sewage disposal; and, more important than all, in the winter, it had a municipal steam heating outfit that made it independent of everything and everyone on the frozen, snow-covered earth excepting, only, the powers that produced the fuel oil for the furnaces—and it had a good supply of that.

Sabetha had no injunctions to fear, last winter. It had no franchise grabs to fight, no coal trust to fear, and not one lawyer within its peaceful limits. This doesn't mean that Sabetha has an embargo on lawyers. It means, only, that a man in that profession would starve to death there—and so would the honorable police judge, appointed as a necessary part of the town's corporation, if he were not above want, for he never holds court. It means, too, that Sabetha has been wise enough to profit by the mistakes of other towns and cities, and, in view of the record to date, it must have had much to learn. It is, without a doubt, the one town on the American continent so self-satisfied that it is not particularly interested in the commission form of government, although some of its progressive citizens are urging this further improvement, while admitting it is not especially needed. It is in a class by itself, too, in that it has fewer than 125 negative votes in a total registration of about 700 home-owners. And even this timid opposition to things taxable is weakening, thawed out, and warmed into smiles and good nature by the grateful radiation that comforted everyone while the outside world was wrapped in gloom.

But there are no ward bosses in Sabetha, and, as I said a moment ago, no lawyers.

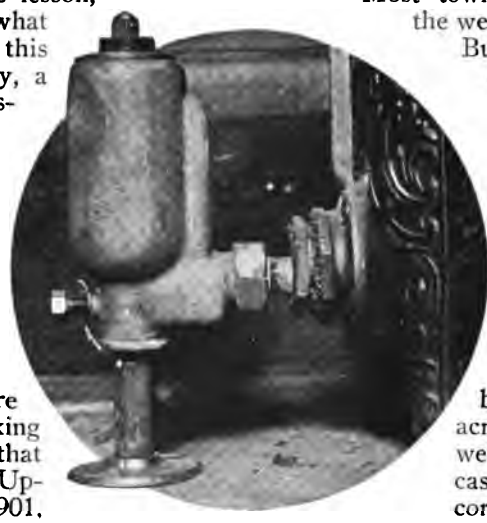
There never was an engineer, I suppose, who did not, at some time in his life, try to figure out a way to use waste steam, especially when he learned that only about twenty per cent. of the amount created actually did any work. This problem stuck in the mind of George Edward Johnson, Sabetha's city engineer, for years. It had been there a long time. He didn't solve it, either; let me put that down now; but he learned how to use the steam he created, instead of letting it float away into the Kansas sunshine, and he told Sabetha



GEORGE EDWARD JOHNSON.
The engineer who installed Sabetha's municipal steam-heating system, which has given such excellent satisfaction.

what to do and how to do it, a raw, young fellow whose chief technical training had been gained in a hurry-up course in the Armour Technological institute, in Chicago. While some others in the profession, marooned in small towns, were content to draw their salaries, Johnson, helped by a wife—a Chicago girl—who was a graduate civil engineer, figured out the way, learned the lesson, and gave the town what few towns have, in this or any other country, a municipal heating system that heats.

It isn't an easy task to unravel the municipal business negotiations of the average American city or town. There is always so much to hide. But you can see the books in Sabetha. They are as clean as the drinking water. They show that the town began its "Uplift Movement," in 1901, when it spent $19,000 for a lighting plant. To cover this indebtedness the town issued $10,000 in four per cent bonds, and issued six per cent warrants for the remainder, to be paid out of earnings. The bonds, of course, were paid out of the taxes, at that time eight mills on the dollar. Now the tax rate is six mills.



THE THERMOFIER—A DEVICE ATTACHED TO THE RADIATOR.
The steam passes through this apparatus and returns to the heating plant as water.

When a town of 2,000 population gets electric lights its people, ordinarily, consider themselves as near Heaven as any rural inhabitant has an every-day right to be. But in Sabetha's case this improvement was only a beginning. True, it dragged along for seven or eight years rather discouragingly contented, but then came the demand, one day, for water, pure water, and lots of it. So Sabetha, with its customary unanimity of public opinion, remarkably infrequent in American communities, voted some more bonds, $65,000 worth, at 4½ per cent., rebuilt its light plant, put in oil-burning apparatus, erected a storage tank for oil, a tank that holds 22,000 gallons, constructed a smoke stack that cost $1,400, and made a contract for fuel oil at 2⅞ cents a gallon. This was two years ago. Citizens of Sabetha bought $30,000 worth of those bonds, and if the law had not required that the whole public have a chance at them they would have bought the entire issue, the bankers say.

Being an inland town, a no-river settlement, Sabetha had to dig for its water. Most towns would have bored the wells and let it go at that. But Sabetha's wise men did more. They pestered the state board of health until its experts journeyed to its borders, and marked the best site for four wells. The site chanced to be on a man's farm—all the land out there is on some one's farm—so Sabetha bought the two acres for $1,000, put a well, 140 feet deep, steel-cased, at each of the four corners, and promptly planted the tract to alfalfa. Now alfalfa, you must remember, is the golden egg of Kansas. In this case the crops, four or five in number, cut from the town farm, pay the interest on the investment. And the electric light plant, down town, does the pumping.

Sabetha seemed, by this time, to be proceeding rather more smoothly on its municipal career than observers in the near-by towns had believed, or, in some instances, hoped; but Engineer Johnson wasn't quite satisfied. The electric light-water plant was not doing enough work, and the town needed heat. The old problem about steam came back. It worried him to see that white cloud mounting, hour after hour, into the blue. A big hospital was being planned for the town—on the lines of the Mayo brothers at Rochester, Minn.—and there was talk of heating it with steam. Why not do this for the whole town, Johnson demanded? He knew, now, just what he needed; a simple little attachment for the radiators, a little attachment with a big name,

a thermofier! An instrument maliciously planned to defeat Jack Frost.

Some may not understand the hard times Johnson had while he was planning this improvement. Many of the best men in the town who had been leaders in public improvements had to "Call a halt" when the young engineer proposed to send steam through pipes to radiators, pass it through this thermofier arrangement, and return it to the plant as water to be reboiled into steam, and again sent out, again and again, and some more yet, and all for a price below the cost of coal. They were public-spirited citizens, they wanted that understood, but there was a limit, and when it came to this kind of a scheme—well, although residing in Kansas, there would still be a demand for visible proof.

The lowest bid Johnson turned up in Chicago, to equip his town, was $9,500. And that was rather too stiff. The doctor with his hospital plans, involving about $75,000, was with him, and together they searched the town. It must be possible, Johnson argued, for a town to get wholesale prices when it bought in wholesale lots. He got his cut rates, too, finally, and then the "Big Business" came around with a lower bid and Sabetha got its pipes and its radiators and the little contraptions with the long name. When the system had been installed; the labor of digging having been done by high school boys for twenty-five cents an hour; Sabetha had spent exactly $4,922. That included the vacuum pumps. Standard steam pipe was used, in size eight inches at the plant, reduced to seven inches, two or three blocks away, with a three-inch return pipe all the way. To serve a consumer a two inch tap pipe was used, with one-inch return pipe.

The pipes were laid in a conduit which cost, for material and labor, including the digging of the ditch, at 25 cents an hour, $2 a foot. The conduit to carry the pipes consisted of a pine box of one-inch stuff, having no cover, laid in the trench on top of four inches of concrete, at the bottom of which was put a four-inch tile to carry off any seepage. The main steam pipe and the return pipe were laid in the box which was filled with concrete. Expansion joints care for the usual pipe activity, and under the conduit a roller at certain intervals disposes of "creeping." The construction, the engineer believes, could be done somewhat more cheaply after the first trial, but this was one of the things they learned by experience.

Steam, Mr. Johnson knew, could be produced, alive, for nine cents a square foot of radiation, but thermofiers were needed, and money for development was needed, so they charged 25 cents. He satisfied himself, too, that electricity could be produced at the board for 3¼ cents a kilowatt hour, if fuel oil were used. One gallon of this oil will evaporate fourteen pounds of water. The steam produced is sent through the pipes at one pound pressure, usually, but it enters the vacuum at the velocity of a cannonball, and when it condenses in the radiators the water is pulled back by these vacuum pumps through a smaller pipe lying underneath. The pumps are duplicates having 6 by 8 steam cylinders, and 12 by 8 water cylinders. Less than two per cent. of the steam is wasted in the process.

Of course no one man, "unaided and alone," could handle a deal like this, unite all the opinions, and satisfy every viewpoint. Sabetha has a finely organized Commercial Club which holds the people's confidence—it is the people, for that matter—and a city council which does just what the said Commercial Club thinks is right. It was this representative body that carried out the inside ramifications of the business when it came to equipping the stores and factories and homes with radiators. These were bought by the town in Chicago, and sold to the consumers at an advance just high enough to pay for the work of putting them in. Seven blocks, or, rather, three on both sides, had been equipped when the extremely cold weather came. The rate for this service is now twenty-five cents a square foot of radiation, about 75 per cent. the cost of coal, the users say, but this will be reduced after the plant is paid for, which will be in a little more than two years. The revenues from steam heating, the last service year, will be about $2,000. The town used, last winter, 10,000 square feet of radiation. As the surrounding towns are arranging to buy electric current from Sabetha for

light and power, more steam will be generated, and in this way the inevitable extensions will be supplied those who need steam heat.

One of the chief joys of Sabetha, with its fuel oil furnaces and its steam radiators, is the town's cleanliness. It has no coal smoke. The houses are bright, the windows shine. One's linen shows no marks of black. There are no ashes in the alleys. There isn't any coal in the town, except in the home districts where the steam pipes have not been laid. And these districts will have steam next winter.

To get steam into the homes of Sabetha the property owners must pay for the mains in the street. By combining, this does not create an excessive expense; about $125 to $140. The rate then is based on the price of coal, and what it cost to heat the houses the winter previously. This method was used last winter. For instance, the Sabetha National Bank had a rate of $57. Its coal bill, in the winter of 1910-1911 was $66. It had more steam heat, last winter, than it needed. A drug store 60 x 22, with 16-foot ceiling, paid $41 for its radiation, last winter. It cost $70 to install the system. This store couldn't be heated with furnace for less than $75 a winter. Another delightful feature is the fact that if you don't use steam heat in Sabetha you don't have to pay a tax for someone else's heat. The tax is apportioned among the users, in the shape of payment for services, and those earnings take up the city's warrants issued to pay for the equipment.

PUBLIC SCHOOL BUILDING, WHICH IS BEING PIPED FOR MUNICIPAL STEAM.

HOSPITAL HEATED BY CENTRAL PLANT.

FOR THIS EIGHT-ROOM HOUSE SABETHA FURNISHED HEAT AT A COST OF ABOUT FIFTY DOLLARS FOR THE WINTER.

SABETHA'S ELECTRIC-LIGHT, WATER, AND STEAM-HEATING PLANT.

But Sabetha is just the sort of town

to demand the new service just as fast as it can be supplied. It is a motor town. There are so many motors in use that a special rate was made. I have never seen more electrical conveniences in homes anywhere. They are found in the shops, the butcher stalls, planing mills, garages, grain elevators, and in homes; they are used for passenger elevators, feed grinders, washing machines, ironing, laundries, and dentists' offices. They seem to delight in putting in every convenience they can buy. They were not satisfied until they had spent $26,500, a few years ago, to install septic tanks and sanitary sewers, a system large enough for a town four times as big as Sabetha. Their lateral sewers cost them $15,000 more, and all this tax, as the books show, was paid up within thirty days, except $3,022.12—the treasurer insisted upon having the exact amount reported.

And how about paving? Sabetha will have paved streets, thank you, after a while. It prefers, right now, to let the steam plant pay for itself, as the light and water plant has done. It would like, too, to have a fund—a paving fund, but it does not care to put down a foot of asphalt until all the wires are underground. Think of that in a town of 2,100! You couldn't string a line of poles in Sabetha today for love or money. All wires must go under. There's the "White Way," for instance, on the principal street. The ornamental poles, with three or four globes, have been ordered for seven blocks of business property, and every foot of the wire will go under ground. This improvement will cost every business man $8.33 as an installation charge. After that, presumably, the rate will be "sliding" like the others, for everyone in Sabetha pays according to his consumption, with a liberal discount above certain amounts. The ice plant uses $400 worth of current a month with a four-cent rate. Twelve cents a kilowatt hour is the basis for this charge.

It is due Sabetha at this point to draw attention to the fact that it is not a Socialistic town, a co-operative community or a union of any sort. It is a town almost without politics. Indeed there are no parties when the welfare of Sabetha is concerned. These distinctions are reserved for state and national disturbances and newspaper polls. There are two tickets in the field when the town has an election; Citizens' and Municipal, although both, bless their hearts, are working for Sabetha. The only contest appears to be to see which side can get the candidates first. A city official in Sabetha has precious little to do, anyway. The people don't leave him many of his prerogatives. When something turns up that would look good there they call a meeting of the Commercial Club and talk it over, and that's all there is to it, so far as Mr. City Official is concerned. It would be hard to imagine a happier family, municipally speaking. And not a lawyer in the town.

WATER AND LIGHT TOWER.
This tank supplies the town.

Sabetha, however, does not exactly attribute its prosperity, its freedom from discord to the absence of members of the legal fraternity. No, it does not so indiscriminatingly jumble its causes and its effects. It thoroughly understands that the lack of lawyers alone does not make for harmony. When the good citizens of Sabetha—if that day should ever come—grow fractious and quarrelsome, lawyers may follow.

THE INVISIBLE DETECTIVE

By C. F. CARTER

A DEAF MAN'S HEARING OUTFIT—THE ORIGIN OF THE IDEA OF THE "INVISIBLE DETECTIVE."

"THAT instrument should be at Scotland Yard. It would be the greatest detective of them all," exclaimed King Edward VII after witnessing a demonstration of the dictograph at Buckingham Palace on June 25, 1907. At least, so the story runs; and it is such a good story that to raise any question about its authenticity would be a burning shame.

If the manufacturers of the dictograph had employed a press agent their product might long ago have occupied the center of the stage on the strength of such marked evidence of royal approval. Instead of being given the benefit of such aid the dictograph was left to dub along the best way it could until it became mixed up in a sordid graft scandal in Ohio before it achieved the distinction of a place on the first pages of the newspapers.

On that historic occasion at Columbus, Ohio, the dictograph was hidden under a sofa, with an industrious stenographer at the other end of the wire, while Detective Harrison dickered with members of the legislature and paid them marked bills for their support of an insurance measure in which he pretended to be interested. Sergeant-at-Arms Rodney J. Diegle was more cautious than the others, for he looked into the closet, behind the furniture and even under the sofa before he would consent to talk business with the detective. But Rodney did not see the dictograph under the sofa, or if he did he did not grasp its significance. Because of this lack of perception he is now serving a term of three years in the penitentiary. At his trial the competence of the dictograph as a legal witness was established; for M. Turner, the president of the company that manufactures it, appeared and demonstrated for the benefit of the judge and the jury, not only that the instrument would receive and convey ordinary conversation, but that it would also reproduce the tones of the speakers' voices so faithfully that the listener at the other end of the wire could infallibly identify each voice.

When the exact truth is known about the trial of the Los Angeles dynamiters, if it ever is known to the public, it will be found that the plea of guilty was probably brought about largely by the little dictograph. The same little instrument also caused the arrest of Mayor Thomas E. Knotts, of Gary, Ind., on the charge of soliciting and accepting a bribe of $5,000 for his approval of a public service ordinance. It performed a similar service in a little affair in Salt Lake City in which the head of a brokerage house and three others were involved, to their subsequent sorrow, in a wire tapping scheme. Also the dictograph did some effective work in the election frauds at Louisville, Kentucky.

Two Italians were recently arrested in Pennsylvania for the murder of a paymaster. Although morally certain that they had the right men the detectives lacked the necessary legal evidence to secure a conviction. A hurry call for a dictograph was turned in, then the two suspects were placed together in a cell in which the instrument was concealed. Their lawyer, suspecting the very trap that was laid, warned his clients against

it. To be on the safe side he told them not to speak at all. For nine days and nights the jailers listened, but not one word did the prisoners utter. The silence becoming intolerable at last, they began discussing their crime on the tenth night in tones meant to be too low to reach the ear of the mysterious eavesdropper. They did not stop until they had sealed their own death warrants.

Some time ago the Illinois Central Railroad management became convinced that it was the victim of an extensive swindle in the matter of car repairs. The road's own secret service operators were ordered to investigate, but they could find out nothing. Then an outside detective agency was called in which proved to be equally helpless. When the case was referred to a second outside agency its operative concealed a dictograph in his room at a hotel with the receiver in an adjoining room. Summoning two of the suspected men to his room he said just enough to create the impression that he could tell a great deal about car repair graft if he wanted to, then excused himself and went out. He hurried into the next room where he picked up the receiver of the dictograph and listened.

"What do you think he knows?" asked one of his callers.

"Oh, he doesn't know anything."

"He is on to something, all right."

"Don't you believe it. Let me talk to him and I'll fix things up."

Thereupon ensued a discussion of the story to be told. In ten minutes the dictograph had accomplished something that had baffled the shrewdest detectives in the country for ten months; for when the amiable host returned he knew enough about the affair to warrant the arrest of three or four prominent officers and former officers of the railroad in question. At the preliminary hearing a conspiracy was uncovered which involved a number of railroad employes ranging all the way from yard men to a vice-president. The gang had plundered the company of at least a million and a half of dollars. Had it not been for the dictograph the gang might still be operating.

An officer of one of the largest corporations in the country became convinced that a conspiracy was on foot among a clique of directors to give him the thirty-second degree in high finance; or, as the process was formerly known, to freeze him out. So the officer, who was also a heavy stockholder, decided to employ a dictograph to defend himself. The conspirators were in the habit of meeting in a large room purposely left as bare as possible. There was not a picture on the wall, no closets and no furniture except a plain table and some plain chairs. Although the dictograph is a very unobtrusive instrument, there seemed to be absolutely no place to conceal it. But a more careful search disclosed a hollow ornamental brass globe on the chandelier over the table. The transmitter was placed in this globe, the wires were run up through the gas pipe, then down to the desk of the intended victim where the receiver was concealed in a drawer. Thereafter the victim was able to hear every word of the plots laid against him. Under these circumstances he was able to thwart the conspiracy and to save his money.

The dictograph or acousticon, is nothing more nor less than a hypersensitive telephone. When used by the deaf a vulcanized rubber transmitter is pinned on the clothing or even hidden beneath it, with wires leading to a light watch-case receiver and a dry cell battery so small it can be readily carried in the vest pocket. This constitutes an outfit that enables the wearer, however deaf, to hear ordinary conversation. It was long ago adapted for use in churches by placing a battery of transmitters on the pulpit with wires running to certain of the pews where members of the congregation who were hard of hearing could place the receivers to their ears and so hear every word of the sermon as well as their more fortunate neighbors. Today twenty thousand deaf persons are listening through the acousticon to church services.

H. G. Spaulding, who had charge of the acousticon exhibit at the Louisiana Purchase Exposition, was the first to suggest the use of the instrument in jails as a perpetual eavesdropper to listen to the incriminating words of suspects. Three years later the acousticon was adapted for use as an office telephone and rechristened the dictograph. It had a transmitter so sensitive and a receiver so

loud that it was not necessary to talk directly into the former or hold the latter to the ear, though a switch is provided for using a receiver as in an ordinary telephone whenever it is desired to keep communication secret. After pressing a call button the user of the dictograph can lean back in his chair, turn his back to the instrument or get up and walk around the room, dictating all the time to a stenographer in a distant room or carrying on a conversation with a party a block or a mile distant. Its use has by no means been confined to dictation, for it has proved to be a handy means of intercommunication in offices, factories and elsewhere.

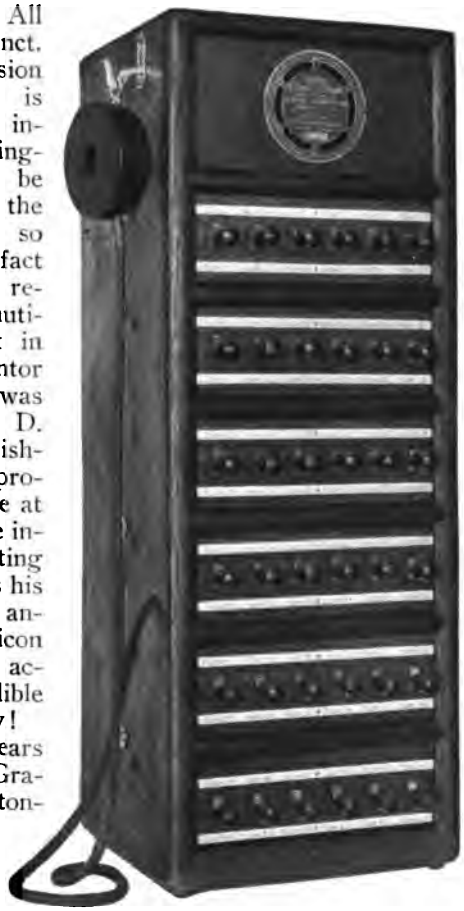
The dictograph is uncannily acute. One may stand eight feet away from it and whisper, yet the words will be distinctly heard by the listener at the other end of the wire. Nor can it be muffled. I pressed a folded coat against the transmitter, leaned against the coat, then talked in an ordinary tone to a party in a distant room on another floor upon unexpected subjects. Even that did not fool the dictagraph, for the answers returned showed that every word was understood.

After all these various uses of the dictograph had been developed and not until then, was a special form of apparatus devised for detective work. The complete outfit is so small that it can be slipped into a coat pocket without making a bulk that would attract attention. The sound collector is a disk of hard rubber three inches in diameter which may be concealed behind the wall paper, beneath a rug, in the furniture, back of a picture or anywhere else. So long as the parties to a conversation do not wander too far from it every word they utter may be heard by a distant listener. Whispering

HOW THE INSTRUMENT IS USED FOR ORDINARY BUSINESS PURPOSES.
The transmitter is at the left, the receiver at the right.

is of no avail. All sounds become distinct.

The first impression of the dictograph is amazement that an instrument so exceedingly sensitive could be made. But after all the dictograph is not so wonderful as the fact that it should have remained so long unutilized. Away back in 1878, when the inventor of the acousticon was nineteen years old, D. E. Hughes, an Englishman who became a professor in the college at Bardstown, Ky., the inventor of the printing telegraph that bears his name, produced an ancestor of the acousticon so sensitive that it actually rendered audible the footfalls of a fly!



A Cousin to the "Invisible Detective"—An interior telephone station without a switchboard.

This was two years after Alexander Graham Bell had astonished the world by exhibiting the first telephone at the Centennial Exposition at Philadelphia. Scientists everywhere were deeply interested in the marvelous instrument and a great many of them were trying to supply the improvements it so sadly needed. In the course of his experiments Professor Hughes attached a tenpenny nail to each of the two wires leading from a receiver, then placing the two nails side by side laid a third nail across the first two. The loose metallic contact thus provided so improved the sound conducting properties of the crude telephone that Hughes began a systematic development of his discovery.

Carbon being unoxidizable and unalterable in air, may be relied upon to produce unvarying results. It also possesses to a marked degree the power of absorbing and condensing the air in its substance. While the resistance of metals to an electric current increases with higher temperatures, that of carbon decreases. These qualities seemed to render carbon the ideal substance for further experiments; so Professor Hughes sharpened both ends of a pencil of carbon, then placed the points in depressions in blocks of carbon fastened to a wooden sounding board mounted on an insulated base and connected with a battery cell, and a telephone. With this crude apparatus he was enabled to hear flies walking and many other sounds never before audible. Because this apparatus did for the sense of hearing what the microscope does for vision Professor Hughes called his invention the "microphone." In an article published in the English Mechanic June 21, 1878, the suggestion was made that in time of war the microphone could be used to detect the approach of an enemy when several miles distant, and that it might even determine whether infantry, cavalry or artillery was marching. Many other strange uses were suggested for the instrument, including the detection of subterranean noises which generally precede volcanic eruptions and earthquakes. As a matter of fact the dictograph actually was used by Prof. Frank Perret, of Boston, on Mount Vesuvius in predicting the earthquake that destroyed Messina a couple of years ago.

In due time Hutchison, who has a long list of inventions to his credit, one of which you probably will hear the next time you fail to step lively in getting out of the way of an automobile, became chief engineer for, and personal representative of, Thomas A. Edison. In fact Edison narrowly escaped inventing the

THE RECEIVER.

THE PARTS OF THE LITTLE INSTRUMENT THAT HAS HELPED CATCH SO MANY GRAFTERS.

THE TRANSMITTER.

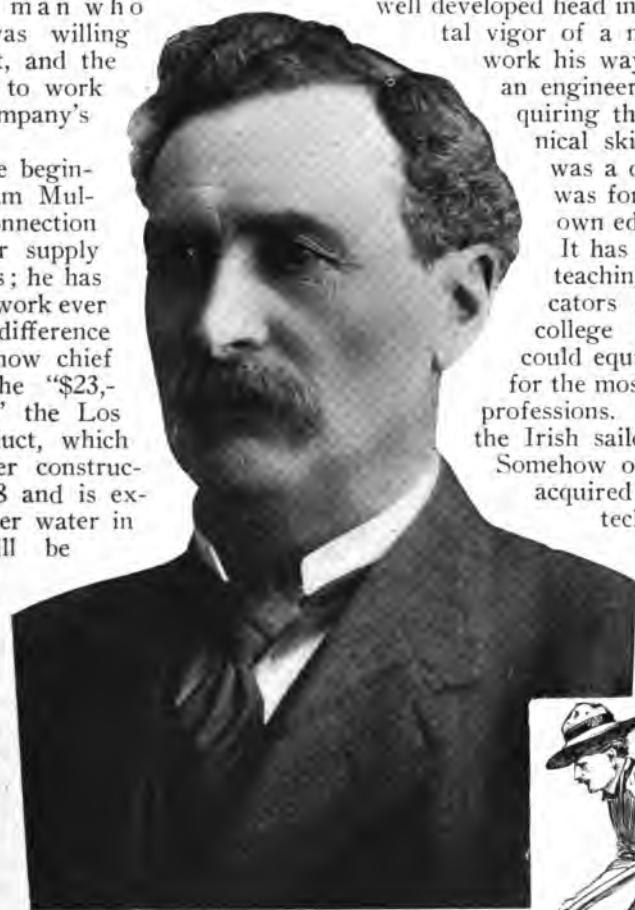
acousticon when he was experimenting with his carbon transmitter in the early days of the telephone. Upon the advice of the veteran his chief engineer has just brought out a new form of dictograph. This is incredibly sensitive. Even a low tone is so magnified that it becomes painful to a normal ear. By means of a switch the instrument can be adjusted to catch loud or soft sounds or to listen to music; for it is a peculiar fact that an instrument that will enable a deaf person to hear conversation will not allow him to listen to music with pleasure, or vice versa. Nor will it convey a shout, though it will render distinct the softest whisper. In fact this instrument has the peculiar faculty of magnifying consonants, particularly the aspirates, more than it does the vowel sounds, which is just what a deaf person wants. The same virtue is as useful to those of normal hearing in ordinary telephoning.

CAPTAIN ROALD AMUNDSEN, DISCOVERER OF THE SOUTH POLE.
On Dec. 14, 1911, the intrepid Norwegian explorer unfurled his country's flag on a vast plateau, 10,500 feet above sea level, now known as King Haakon Land—the southernmost point of the earth.

LOS ANGELES' BIG-DITCH DIGGER

IN 1877 an Irish sailor landed at San Pedro, California, and perhaps with the idea that a taste of life ashore would be pleasant for a change, he hunted a job. The water company had a position waiting for this A. B., a steady job for a man who was willing to stay with it, and the ex-sailor went to work cleaning the company's ditches.

This was the beginning of William Mulholland's connection with the water supply of Los Angeles; he has stayed at this work ever since, but the difference is that he is now chief engineer of the "$23,000,000 ditch," the Los Angeles aqueduct, which has been under construction since 1908 and is expected to deliver water in 1913. It will be about 250 miles long. The work has gone through smoothly in spite of the enormous obstacles, natural difficulties, financial stress and political opposition, for being a municipal undertaking, the project has been subject to attack by every selfish office-seeker.



William Mulholland was born in Belfast, Ireland, in 1855, received his schooling in Dublin, followed the sea from 1870 to 1875 and after entering the Los Angeles Water Company's employ made a thorough study of hydraulic engineering. When the plant was bought by the city in 1902 he was appointed superintendent and chief engineer, and he was one of the principal factors in promoting and executing the great aqueduct project.

For a man at the head of a gigantic enterprise, Mr. Mulholland's manner is remarkably unassuming. His rugged features reveal the quiet strength of the man, and physically, too, he suggests strength; not a tall figure, but a sturdy, well-knit frame. His thoughtful eyes and well developed head indicate the mental vigor of a man who could work his way to the top of an engineering project requiring the highest technical skill, a man who was a day laborer and was forced to seek his own education.

It has been a favorite teaching of some educators of late that a college course alone could equip a man today for the most highly-skilled professions. The success of the Irish sailor refutes this. Somehow or other he has acquired the necessary technical knowledge to put through this gigantic undertaking.

GAVE UP ART CAREER FOR HIS RACE

THIRTY-EIGHT years ago a frail-looking Negro lad, an ex-slave, entered Ames College, Iowa, to specialize in agricultural science. The excitement awakened by a Negro listed in the cause of scientific agriculture was greatly heightened when it was learned that the young man was a painter and designer with a career already well assured.

"Why not push your studies along this line to some extent?" remonstrated James Wilson, Secretary of Agriculture, then a teacher at Ames.

"Because," was the reply, "I can be of no service to my race with this."

These words marked the farewell to the brush as a calling for Prof. George W. Carver, Director of the Agricultural Research and Experiment Station, of Tuskegee Institute, Alabama.

Professor Carver's experiments and instruction at Tuskegee Institute have been invariably with common things—with just such things as the farmers, housewives and school teachers in Alabama have to deal with every day — with the cow pea, the wild plum, the sweet potato, cotton, with the common shrubs and plants about Macon County, Alabama, where Tuskegee Institute is located, and with the soil and its various uses.

It was hardly a decade ago that the cow pea in Alabama, indeed in the whole South, was regarded as a little less than a contemptible weed. It was fed to the cows or left to rot on the land for fertilizer. That man was poor indeed, a poor "red neck" or "hill-side darkey" who served this vegetable as a food for man. This despised product was a subject of Professor Carver's early experiments. Applying his chemistry to the growing of the cow pea, he soon turned it into a delectable food.

Perhaps the experiment which will come nearest to a direct national benefit is that which Professor Carver is now making on various kinds of clay. This clay—white, yellow, and blue—takes the place of lime and the various washes compounded by plasterers. Mixed with water it will wash a rough surface as successfully as will lime. Mixed with turpentine it becomes a rich stain for furniture.

MILO.

SIX FARM LADS WHO MADE GOOD

HOMER.

IRA.

IF you should hunt the country over you would hardly find a more remarkable family than the six Price brothers and one of the remarkable things about them is that they were brought up on a little eighty-eight acre farm in Ohio.

Here are the six: Ira M. Price, Ph. D., LL. D., the oldest, Professor of Semitic languages in the University of Chicago; S. Eber Price, President of Ottawa University at Ottawa, Kansas; Enoch J. Price, practicing law in Chicago; Milo B. Price, Ph. D., Principal of Pillsbury Academy, Owatonna, Minn.; Rev. Orlo J. Price, Ph. D., pastor of the First Baptist Church, Lansing, Michigan; Homer C. Price, Dean of the Agricultural department, Ohio State University.

THE MOTHER.

These are the six living brothers. Mark E., a farmer, died three years ago, and Asa E. died in his freshman year at Denison University. Eight boys in all, no girls; all the boys college trained, five of them graduates of Denison University, two of them from the state University, three of them with the doctor's degree from Leipsig University in Germany—such is the record.

S. EBER.

That eighty-eight acre farm will be found to have had no little to do with the success of these men. When you dig down and search for reasons, you will find those reasons growing in two branches. First, the farm to bring them up on—only eighty-eight acres. Second, their father, Thomas David Price. If he had had a big plantation of a thousand acres on which the boys needed only to scratch and not to dig and help their father make a living for the family, thereby making a living for themselves, they might not have achieved such success.

The proximity of Denison University enabled Mr. Price to keep up the habit of work, in his boys, as well as to gratify his desire to give them an education. Go off to college and spend their patrimony? Not exactly. When Ira, the oldest, started, he walked, the first year, back and forth each day. The second year, he rode horseback. The third year, having kept his constitution up to standard, he boarded at the school and got down to business in a still more thorough way. The rest of the eight boys followed the same schedule, walked one year, rode one year, boarded the remaining years. Ira is now fifty-five years old, Homer thirty-six. That shows how long the Price procession was in passing through college.

ENOCH.

It is quite possible, that those Saturdays on the farm heightened the respect of those young men for the professional life and tightened their grip on the ambition for that life.

ORLO.

SOME OF THE COAL PIT LADS WHO ARE TYING UP ENGLISH INDUSTRY.

THE great strike of the English coal mine workers, which has aroused world-wide interest as being one of the most formidable upheavals of labor ever known, seems in a fair way to be settled. The average weekly wage the operators have paid these colliers has been but twenty-eight shillings, eight and a half pence, or less than seven dollars a week. On an average, four miners lose their lives daily.

The measure for a minimum wage that David Lloyd-George, Chancellor of the Exchequer, has succeeded in forcing upon a somewhat reluctant Parliament is bringing the strike to an end.

DAVID LLOYD-GEORGE, WHOSE PROPOSAL FOR A MINIMUM WAGE LAW TO SETTLE THE GREAT ENGLISH COAL STRIKE IS RECEIVING FAVORABLE ACTION IN PARLIAMENT.

This minimum wage will vary somewhat according to the district in which it is to be put into effect.

THERE ARE RICH COAL FIELDS UNDER THE EARTH NEAR WILLISTON.

HARNESSING THE "BIG MUDDY"

By

ARTHUR CHAPMAN

WHEN it was decided to reclaim lands in the vicinity of the towns of Williston and Buford, North Dakota, with water pumped from the Missouri river, it was discovered that a situation confronted the engineers such as they had never before experienced. How to get water from the uncontrollable "Big Muddy" to the high bench lands embraced in the irrigation project, was a problem of sufficient magnitude to stagger anybody but an American construction engineer.

The Missouri has always been regarded as the wildest and most unman-

ageable of American streams. Nowhere is it more erratic than in the vicinity of the Williston and Buford-Trenton projects. From the high bluffs that line the river, the Indians in early days used to watch the struggles of the keel boatmen, who poled many adventurers up the watery highway of romance in the days of the fur hunters. Many a keelboat was caught in a treacherous eddy, or struck by a giant log shooting down the stream as though driven by a catapult, and countless expeditions were halted while vain search was made for drowned voyageurs and lost goods. Many a successful trapper, floating his bales of furs to St. Louis, after a season or two of hazard on the beaver streams at the Missouri headwaters, was caught by a snag in the boiling, muddy river, or thrown against a sandbar in midstream, and was heard of no more. The small steamboats that navigated the Missouri in later days had to combat a swifter current and a more uncertain channel than the big boats that plied the Mississippi.

In seasons of heavy floods and succeeding droughts, there has been a variation of nineteen feet in the Missouri river level at Williston. The main channel has been known to shift half a mile, for no apparent reason. Sandbars have formed in the deepest portion of the channel, and have thrown the full force of the stream against some unprotected bank, and thousands of cubic yards of the bluff have been gnawed away by the remorseless and erratic "Big Muddy."

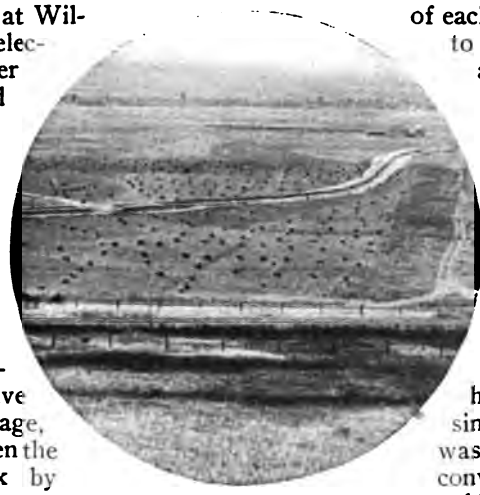
To harness such a stream by ordinary methods was clearly impossible. On the Sacramento river, steamboats, equipped with pumps do effective work in watering adjacent lands in time of drought, and in unwatering the land back of the protecting levees in time of flood —but the Sacramento is gentleness itself compared with the Missouri. Operating pumping steamers in a current that averages eight or nine miles an hour, would be clearly impossible. Anchors would be ripped out of the muddy bottom, if not by the force of the current itself, then by the impact of the great trees that come hurtling down stream when the June freshet is on. To establish an ordinary concrete pumping plant was equally out of the question, as the engineers at such an institution would be likely to wake up some morning and find their pumps empty, with the Missouri gurgling mockingly half a mile away.

H. A. Storrs, the government engineer in charge of the work, finally decided to

NORTH DAKOTA
STATE EXPERIMENT FARM AT
WILLISTON, IN VICINITY OF RECLAMATION WORK.

ONE OF THE FIRST PROBLEMS THE ENGINEER MET WITH.
A siphon was put in to carry over the water for the Williston pumping project.

install a power plant at Williston, from which electrically conveyed power could be transmitted to pumping barges. One of the barges was to be stationed at Williston and power would be conveyed to the other barge, twenty-eight miles distant, to irrigate the Buford-Trenton project. In order to solve the problem of anchorage, it was decided to fasten the barges to the bank by means of extensible overhead booms. These booms, swinging clear of the river, allowed the floating debris to pass beneath them. Ordinary floating booms would soon have caught an immense amount of debris, and would have wrecked the entire plant.



LAND IRRIGATED BY THE WATERS OF THE "BIG MUDDY." Looking south from Buford, N. D.

In the matter of attaching pipes to the barges, another problem was presented. Stationary pipes were out of the question, owing to the shifting nature of the channel, so pipes with rubber joints were attached. These could be shortened or lengthened as the channel shifted its position.

Mr. Storrs realized that the question of floating debris would be a serious matter, even though no more than the prow of each barge were presented to the current. He built a floating dike—for there is no other description that will fit his device—encasing iron pipes in boxes made of heavy planks. By filling or emptying these pipes with water, the sectional boom thus constructed could be kept at any height desired. By sinking it until the top was awash, the boom was converted into an impregnable defence. Trees and logs, which came down the stream like immense sea serpents, struck this improvised rampart, and were fended off by pikemen who were on guard night and day in times of flood.

Generally when such an object in a stream strikes an obstacle, it dives like a huge fish. This would be disastrous to the pumping machinery on the barges, but, by sinking the protecting booms in the manner described, the engineer had put the center of gravity of the defence below the center of gravity of the attacking object. The big trees were veered off by the pikemen, and floated on down the Missouri, without having harmed the pumping barges.

THE PLANT AT WILLISTON FROM WHICH ELECTRIC POWER WAS TRANSMITTED TO PUMP WATER OUT OF THE MISSOURI, AT A POINT TWENTY-EIGHT MILES AWAY.

The battle was far from being won after the barges had been made secure. A pretty problem had to be overcome in developing sufficient power at the generating plant. The coal, which was dug from adjacent beds located by Mr. Storrs, was more than 40 per cent. water. The utilization of this coal, so that it developed the required amount of horsepower is a feat which has interested all engineers who have inspected this unique plant. The coal used at the government plant is mined and delivered by gravity to the furnace at the power station. Sufficient horse-power is developed to run both pumping barges and to irrigate many times the acreage now under cultivation.

SUCTION SIDE OF ONE OF THE PUMPING STATIONS.

ONE OF THE BARGES WITH ITS DISCHARGE PIPES FOR TURNING WATER UPON THE PARCHED DAKOTA SOIL.

A SETTLING BASIN HAD TO BE BUILT TO REMOVE THE SILT BEFORE FLOODING THE FIELDS.

Missouri river water, being unlike the water of any other stream in the world, offered a considerable problem in itself. At times, when the river is at its muddiest, there is twenty-five per cent. of solid matter in its composition—rich alluvial float that has made the whole Mississippi Valley an agricultural wonderland, but which is not exactly a comfort to the irrigation engineer. To pump such water into canals and laterals would mean the rapid filling of costly irrigation works with silt. A settling basin was constructed, close to each pumping barge. Into this basin the muddy water of the Missouri was pumped. The silt was allowed to settle to the basin, and the clear water was run off into the system of canals which eventually will make this whole bench-land region look like an immense checkerboard of small but prosperous farms.

In disposing of the accumulation of silt in the reservoir, a unique suction arrangement was devised. A waste-pipe, air-tight and capable of standing heavy pressure, was laid under the river bank of the reservoir. A nozzle-like arrangement, operated by a man on a floating platform, sucked up the loose silt on the bottom of the reservoir, and the mud was discharged through the pipe into the Missouri.

In constructing the canals, a problem confronted the engineers at the outset — the question of crossing the Great Northern railroad tracks. Here a siphon was constructed, and the water dives under the tracks and reappears on the other side, to make fertile the bench lands near Williston.

Power plants and pumping barges would also seem to solve the problems of such hitherto unconquered streams as the Colorado and its tributaries, the Upper Yellowstone and Snake, and many other rivers that travel for miles at the bottom of deep gorges.

THIS HOUSE, WITH STAIRWAY TO ROOF, COST SEVENTEEN HUNDRED DOLLARS.

CHEAP HOMES FOR WORKING MEN

By

HARRY F. KOHR

THE problem of building good cheap homes for working men is one that has engaged most serious thought for many years and nobody yet appears to have hit upon the ideal plan. Thomas A. Edison is one of those who have been working on the problem and some time ago he announced a plan for building cheap houses of solid concrete by pouring them in molds. As yet his plan has not reached the stage where any of the houses are being built or poured.

Now comes an Oklahoma man who believes he has gone a long way toward a solution of the housing problem and he has met with such success that the Department of Commerce and Labor has become interested in his efforts.

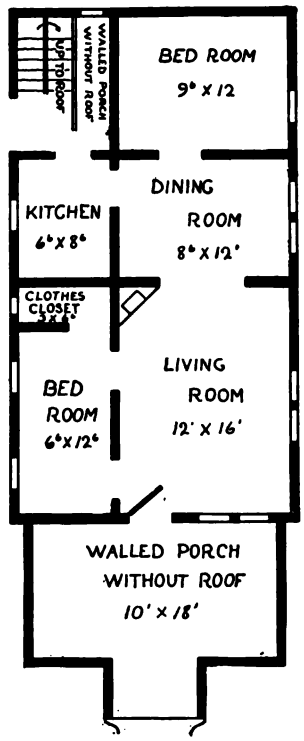
This man doesn't pretend he is an Edison, however. He is merely a practical builder. He doesn't profess to draw any conclusions, but simply submits the houses he has built as evidence and lets the results speak for themselves.

What this man is doing is to build a cosy, durable and artistic five-room dwelling of hollow tile and cement, strong enough to last a hundred years, on a lot 75 by 140 feet in area, costing $500, with a chicken house, tool house, water supply and sewer system thrown in, and selling the whole outfit for $1,500 payable on installments. He pays high wages to his mechanics, uses the best of materials for which he is forced to pay high prices, operates on borrowed capital for which he pays a high rate of interest, and yet admits he is making a good profit. He is selling his houses as fast as he can build them and he can't build them fast enough to meet the demand.

When this builder first began his work he built a four-room house which he sold for $1,000, including the lot. He found that the greatest demand, however, was for a larger house, so he added another bedroom on the rear and made other changes in the plan which brought the cost up to $1,500. A still more artistic home—one on the same plan—sells for $1,700. A bathroom added to either plan, including cost of tub, lavatory, etc., would increase the cost about $150.

"In any large city where sand, materials and labor are cheaper, the $1,700 house could be built for $1,500 and the $1,500 house for proportionately less," the builder says. This is rating the lot at $500.

A glance at the floor plan, which is same for both houses, will show that there is no waste of space and that the rooms are of ample size. The walls and partitions are of hollow tile, plastered inside and outside with mixed lime and cement plaster, the exterior walls being given a rough finish. Hollow tile construction, as is well known, is warm in winter and cool in summer. Practically the only difference in the two houses is the roof. The roof of the $1,500 house is of the ordinary slant type, covered with metal Spanish tile. In the $1,700 house the roof is flat, surrounded by a three-foot railing, finished with stucco the same as the walls of the house. The roof may be used as a roof garden or as a sleeping porch in summer. A stairway from the back porch gives access to the roof. The roof is supported by 2x8 rafters, covered with 1-inch boards, over which is first laid four thicknesses of tar-paper laid without nail holes. The paper is covered with a lapped layer of expanded metal lath over which is spread two inches of concrete covered with asphaltum. This makes a roof which, the builder says, should be weatherproof for a hundred years.



PLAN OF A FIFTEEN-HUNDRED DOLLAR CEMENT HOUSE.
A practical design suitable for any small family.

The houses are 35 by 20 feet, with these interior dimensions: living room, 12 by 16; dining room, 9 by 12; kitchen, 6½ by 9; alcove bedroom, 6½ by 12½; rear bedroom, 9½ by 12; clothes closet, 3 by 6½; back porch, 7 by 10; front porch, 10 by 18; roof garden, 20 by 35. If a bathroom is desired this can be provided for by setting the kitchen more to the rear and placing the bath room back of the closet, and cutting down the closet space

INTERIOR OF ONE OF THE LOW-COST CEMENT HOUSES.

so as to provide a hallway into the bathroom.

These houses are being built in a small town in Oklahoma where there is as yet neither waterworks nor sewers, so that it has been necessary for the builder to provide for each set of six houses a septic tank for sewage and a windmill with a 100-barrel tank for water supply. There is natural gas, however, and each room is piped with it, handsome and artistic fixtures being included in the cost of the house. In the living room there is a basket grate fitted to burn either coal or natural gas. Very little wood is used in the houses, even the floors being of cement, while the ceilings are of stamped metal. The house is screened at every opening.

THE REAR PORCH IS VERY CONVENIENT FOR AIRING BEDDING.

Only expert labor is employed by the builder and he pays "top" wages: $6 a day for eight hours for brickmasons and plasterers and fifty cents an hour for carpenters. The tile and cement are of the best quality. The sand that is used is hauled one hundred miles by rail and then a considerable distance by wagon, which makes its cost laid down on the site about three dollars a yard.

Under these conditions, the builder estimates that the cost of each house, where he now is at work building, is about $200 in excess of what it would cost in Chicago, St. Louis, Kansas City or any Eastern city. The final cost, built in any city would, of course, depend on the lot. The house would fit very well on a lot as small as twenty-five feet and better, of course, on thirty feet. A cellar and sewer connections would increase the cost in the city, but, taking everything into consideration the city man, by following the floor plan and the style of construction used by the Oklahoma builder, ought to be able to build himself a cozy, modern, and substantial dwelling for $2,000 or less, including the cost of his lot. It will be noted, also, that the style of construction is one that reduces the cost of repairs to almost nothing, since there is practically no painting and no woodwork to be damaged. The houses as built in Oklahoma have tinted walls which are cheaper and more sanitary than papered walls and permit of simple and yet elegant effects that cannot be obtained in cheap paper.

HOUSE SOLD ON THE INSTALLMENT PLAN FOR FIFTEEN HUNDRED DOLLARS. This includes gas fixtures, drainage, sewage pipes, etc.

With reference to the problem of the increased cost of living, in combination with that of rearing a family, half-decently at least, these cheap homes for working men being constructed by this Oklahoma builder, take on a significance entirely out of proportion to the modest nature of the enterprise. The demands of persons of moderate means is neither for elegance nor show but for a stability and permanency of structure. What is wanted is something substantial, which is, at the same time, comfortable and cheerful.

Screening in each of the houses at every opening may appear a small thing, but assuring as it does a safeguard against the annoyance and danger of flies and mosquitoes, it would indicate that other less obvious precautions were also provided for in these cheery little dwellings.

DOCKING A BIG LINER

By

CHESTER CARTON

WHEN the *Olympic* arrived in New York on her maiden voyage she was three mortal hours in covering the nine miles from Quarantine to a point on the Hudson opposite her dock at Twenty-first street; and yet the *Olympic* has proved herself capable of twenty-one and a half knots, or twenty-four and three-quarter miles, as a landlubber would put it, an hour. There was nothing the matter with the *Olympic,* but there was so much the matter with New York harbor that the big ship could only be docked on the slack of tide. If the captain had been a railroad man he might have explained that he was "killing time" on the way up from Quarantine; but being merely a British mariner he could only marvel in his unimaginative way at the people who are so busy admiring their own progressiveness that they never have time to catch up with the procession.

Most of the difficulties arise from the lack of intelligence displayed in arranging the docks of New York harbor, every one of which is placed at right angles to the current. In Liverpool the steamer floats gracefully and easily up to a landing stage parallel with the stream. At Hamburg, Rotterdam, and in fact every up-to-date port, the docks are parallel with the flow of the tide, or nearly so. It took the vaunted ingenuity of the Yankee to figure out a scheme of docks athwart the current.

There are two other wholly unnecessary drawbacks which make the docking of a liner in New York the work of an expert. The first of these drawbacks is that the slips are only two hundred and fifty feet wide. At best this affords but scanty room for maneuvering a vessel seven hundred feet or more long and eighty or ninety feet wide; but they rarely have even that much space. Nearly always there is another vessel at one side of the slip which with a flotilla of lighters and barges receiving or discharging cargo take up more than half the space. Added to all this the Hudson is so shallow that the big Hamburg-American liners, which dock in Hoboken, actually drag in the mud occasionally.

In Hamburg and other European ports dredges are always at work to maintain an ample depth in the harbor. Neither the National Government, which has lavished millions upon the construction of an entrance to the harbor, nor the city of New York spends a cent in clearing away

THERE ISN'T A SECOND RATE PORT IN EUROPE THAT HASN'T A MORE INTELLIGENTLY ARRANGED SYSTEM OF DOCKING THAN NEW YORK.
Laying the vessel alongside the pier.

the annual deposits in the Hudson. Finally, the docks are built with vertical walls with only a narrow runway at the side. Some of the big liners have so much flare at the bow that the overhang arrives some time in advance of the rest of the hull. Watchful eyes and skillful hands are required to prevent this overhanging bow from gouging several thousand dollars worth of damage out of the dock structure. Should the vessel happen to have a list the superstructure may come in contact with the dock with disastrous results.

To maneuver masses of steel seven or eight hundred feet long and weighing from thirty thousand to sixty thousand tons into position in such exceedingly narrow quarters, with a swift tide always ready to take instant advantage of a false move, is the task of the marine superintendent.

While the liner is feeling her way cautiously up the crowded river the marine superintendent's navy of tugs clears for action. Sometimes when conditions of wind and tide are favorable a liner can be docked with the aid of one or two tugs; at other times as many as fourteen find their work cut out for them in assisting a vessel of twenty-five thousand tons net register into her berth. As each one gets ten dollars for the job the docking process is likely to be expensive.

When the ship is within two hundred feet of the dock three men put out in a row boat to bring the first line ashore. The instant that line reaches the pier the responsibility of the marine superintendent begins, while that of the captain ceases. Not legally, mind you, but practically. In the eyes of the law the captain is always responsible, though as a matter of fact the captain only has a free hand while he is on the high seas when no one else wants to run the ship. As

READY TO GIVE ORDERS FROM THE WHARF.
The task of docking arriving liners is entrusted to a high-salaried expert, the "Marine Superintendent."

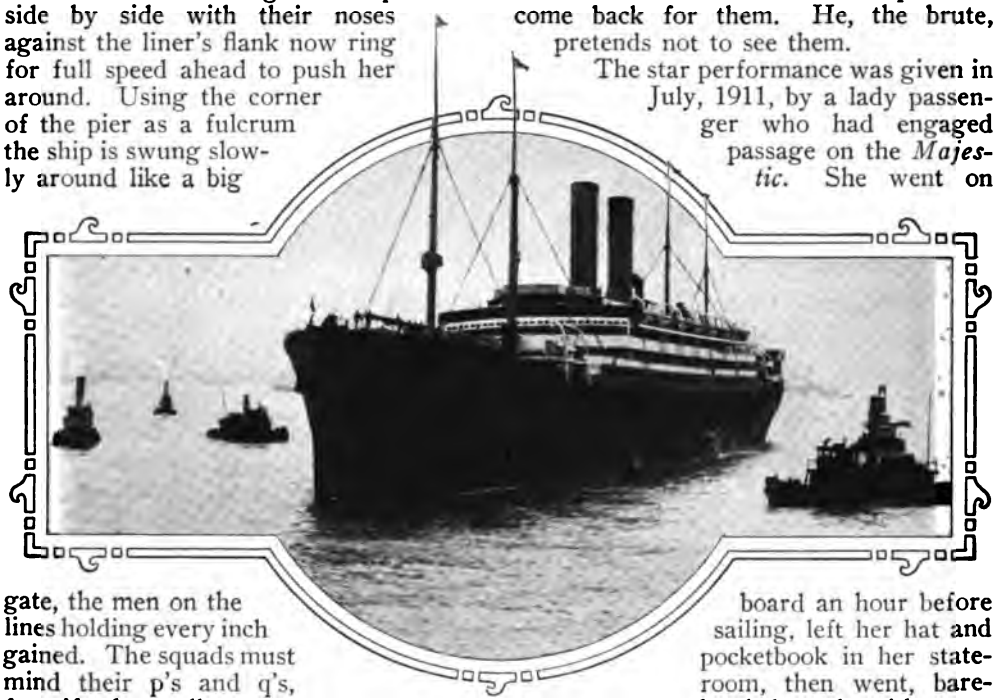
soon as he gets within the three-mile limit a pilot climbs up to the bridge and gives him advice until he gets to the dock when the marine superintendent takes charge.

Like a Mississippi river steamboat a trans-Atlantic liner always lands with her bow to the current; though in tidal waters the current reverses its direction twice daily. Fifty men divided into squads of ten, each under the command of a foreman, are waiting on the dock. Each squad has its part assigned. One squad takes the line from the row boat and hauls in on it until the hawser, an overgrown rope nine inches in diameter is made fast. Others are ready with fenders consisting of large bundles of cordage to protect the vessel's side as she cautiously edges up to the dock. Others are ready to take care of the next lines. Altogether there are five lines to be attended to before the ship is finally moored in her berth, and it takes ten men to handle each one.

All hands, the men on the dock, the tugs, and the officers on the bridge, work together on signal from the marine superintendent. From his position on the open end of the dock he keeps a wary eye on everything—the men, the tugs, the vessel, the wind, and the tide. As all hands know their business the marine superintendent talks in the sign language to his men and to the officers on the bridge. The tugs, being farther away, sometimes have to be signalled with a flag. On rare occasions the marine superintendent may have to use the megaphone; but he does it reluctantly, for he hates noise, or anything suggestive of a play to the galleries.

GETTING THE FENDERS BETWEEN BOAT AND PIER INTO ACTION.

After considerable trouble the liner is laid up against the end of the dock, bow to the tide, with spring line in position and tugs ready for business. At the psychological moment the marine superintendent gives a signal. The word is passed to the bridge where the man at the marine telegraph signals the engine room to come ahead on one screw and to back on the other. The tugs lined up side by side with their noses against the liner's flank now ring for full speed ahead to push her around. Using the corner of the pier as a fulcrum the ship is swung slowly around like a big gate, the men on the lines holding every inch gained. The squads must mind their p's and q's, for if they allow too great a strain to come upon one of the big ropes it is likely to snap; and when a nine inch hawser snaps any one in the neighborhood is liable to get hurt. More than one man has had a leg broken on the docks of New York when a hawser snapped. Some have been killed. In the course of time the liner is swung around until she lies parallel to the dock, and is coaxed into her berth.



TUGS BEGINNING TO CLOSE IN ON A STEAMER COMING INTO PORT.

So far as can be ascertained from the records no trans-Atlantic liner has ever sailed from New York with all the passengers who intended to go on her. Just as the vessel backs into the stream a taxicab dashes up to the pier entrance, one or more intending passengers prance up stairs then down the whole length of the pier where they lean out of the end windows and beckon to the captain to come back for them. He, the brute, pretends not to see them.

The star performance was given in July, 1911, by a lady passenger who had engaged passage on the *Majestic*. She went on board an hour before sailing, left her hat and pocketbook in her stateroom, then went, bareheaded and without a cent, out on the dock to watch the preparations for sailing. Not until the vessel was in midstream did it occur to her that while her luggage and money were sailing for Europe according to schedule she was not. Her hysterics availed her nothing, for the marine superintendent refused to become an accessory to her suicide by sending her out on a tug.

DIGGING UP BONES OF PREHISTORIC MONSTERS THAT HAVE BEEN BURIED A HALF MILLION YEARS.
This lake of asphalt has formed a trap for almost countless decades.

MINING FOR TIGERS

By

CHARLES FREDERICK HOLDER

CALIFORNIA suggests gold mines and placers, but the traveler over its mountains and valleys will observe some strange contradictions: rivers running under ground and completely out of sight, and rats living in trees. He may see oil pumped out of the ocean seemingly, and springs of oil at sea. I have seen men standing in a bed of clams on a mountain slope shoveling them out and they may have been a million years old. I saw a railroad laid through the grave of a giant elephant that had been caught in a quicksand half a million years ago. In any event the old stream bed was on the face of a cliff, high above the old stream where the elephant tried to drink.

But the most remarkable sight in California today is a mine where tigers are taken out with a pick, or it may be a giant sloth, or a lion or a mastodon or a dozen or more strange animals.

Probably animals can be mined in various places, but I fancy this mine on La Brea ranch six miles west of Los Angeles is unique from the fact that it is an asphaltum trap which entangled animals of all sizes and kinds perhaps a million or more years ago and is doing exactly the same thing today.

In a word a bit of the old Tertiary time has been passed down to us almost as it stood ages ago and is today trapping animals as it did then. Away back in 1885, the cattle ranch was owned by a Mr. Hancock and was supposed to be injured by the curious asphaltum or tar springs which appeared at various places. They were little tar volcanoes, generally small, some several feet across and one of pure tar the size of an ordinary well.

Finally some demand was occasioned

for this tar, and it was sold for a few dollars a carload, the workers in time making a big hole in the soil which filled with water, tar and oil, and was called tar lake.

There was one drawback to this tar. It was in places filled with bones which in time became so plentiful that the demand for the tar ceased. The pool was supposed to be a menace, a horse and wagon backed in one day and disappeared and calves, sheep, colts, etc., were at times lost in it. The surface is continually broken with gas explosions showing that it is over a number of tar springs of the kind found on the surface.

A few years ago, some one noticed a tooth of a "sabre tooth tiger" in a Los Angeles office and recognizing it as a rarity traced it up to "La Brea ranch." The attention of paleontologists was attracted and the extraordinary discovery was made that the tar that had been mined by Mexicans for years and sold for almost nothing contained the skeletons and bones of animals so rare and valuable that the bulk thrown away represented a great fortune.

REMAINS OF ELEPHANT SKULL.

THIGH BONE OF SLOTH. THE HEAD WEIGHED OVER A TON.

SKULL OF GIGANTIC BISON.

SOME OF THE SPECIMENS LOS ANGELES HIGH SCHOOL CHILDREN DISCOVERED BENEATH THE SKELETONS OF SABRE TOOTH TIGERS, AT LA BREA RANCH.

La Brea at once became the cynosure of the eyes of the scientific world. In the meantime the entire region had become a great oil field and the owners very liberally gave several schools and scientific institutions the privilege of mining for a certain number of months. With this understanding the Museum of the Los Angeles Normal College and High School began work by putting classes of young men and women volunteers at work and one day when the writer and John Muir arrived on the scene the sight was a strange one. Boys and girls in old suits were in a deep hole on the shores of the lake hard at work—one gang pumped out oil and water, another dug the gravel and tar that overlaid the bones while sitting directly in the asphaltum and tar springs were a dozen or more youngsters digging and working with file point and knives into the most remarkable mausoleum ever uncovered in the United States.

It is a curious thing to learn how these bones came here. Here and there little circular outpourings of tar appear, black and shining. Often these are in circular shape, again they run into little gullies and form streams. The prevailing west wind blows dust, sand and gravel over it and very soon the surface has the appearance of being hard. If rain falls it

collects on the tar and stands in big or little pools, a mouse or a skunk comes to drink, it steps in and is immediately caught by the tar, which is remarkably tenacious. The animal struggles, falls over, becomes completely entangled and in a day or two completely disappears. A skunk, a crow or raven, a meadow lark, have been known to be trapped within a very short time. The same situation held true a half million or a million years ago, though perhaps the springs were bigger and larger and certainly in the Pleiocene time the animals were different.

SKULL OF A SABRE TOOTH TIGER. With these fangs the great beast could disembowel elephants.

Long ago an earthquake or something had made a sharp fold in the rock and the mass of tar beneath had been forced upward by the gas and pressure forming the same traps until today the region is covered with tar for the space of a quarter of a mile and is about fifteen feet deep.

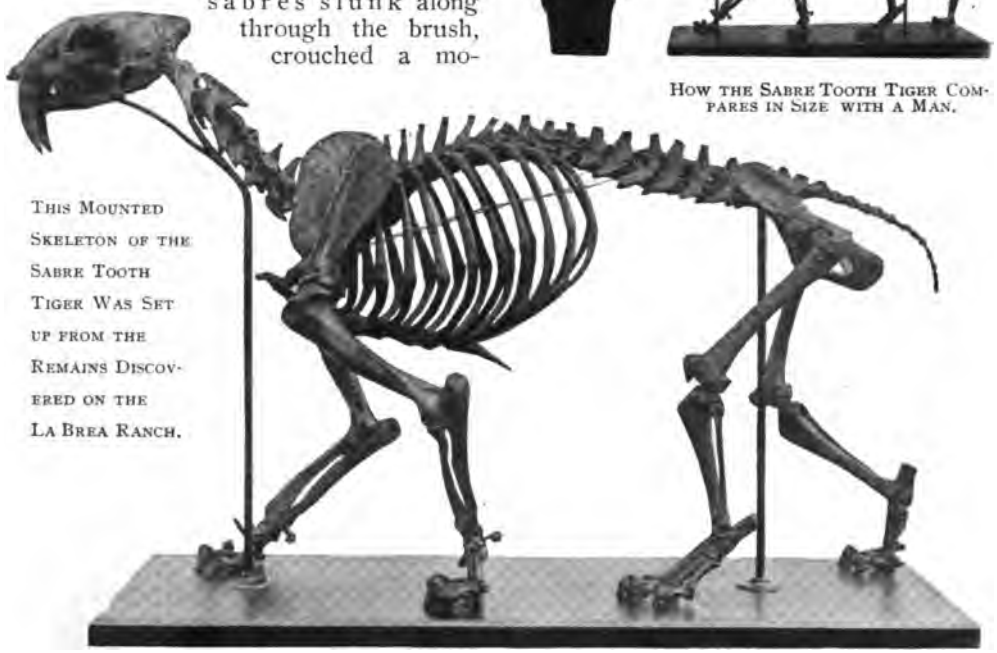
Strange animals lived here in these days. Lions, a tiger with a long dagger-like tooth with a saw-like edge, ducks, geese, coyotes, wolves, rabbits, mice, giant wolves, condors, peacocks, bears, horses, bison, camels, the mammoth and huge ground sloths of a ton or more weight. Horses and camels indicating the middle of the great Pleiocene era. These animals lived in the adjacent mountains now known as the Sierra Santa Monica and roamed the plains and forests where Hollywood, Los Angeles and Pasadena now stand. They came down to the place to drink and met the fate we have seen that befell the skunk and the meadow lark.

The elephant wading into the innocent-looking pool and sand, sank, without knowing it, up to its knees. But when it attempted to move it was trapped. Its mighty struggles, its trumpeting, its rage and fear can be imagined. At last it fell or stumbled and was held by the treacherous tar. Its struggles attracted the marauding animals of the

LOS ANGELES SCHOOL CHILDREN AT WORK TAKING OUT THE BONES OF A GREAT SLOTH.

times. Along came a big tiger with the sabre saw teeth. One of these teeth procured from the professor of the high school for Andrew Carnegie was at least eight inches long and delicately serrated —a terrible ivory poignard. This tiger with the two ivory sabres slunk along through the brush, crouched a mo-

How the Sabre Tooth Tiger Compares in Size with a Man.



This Mounted Skeleton of the Sabre Tooth Tiger Was Set up from the Remains Discovered on the La Brea Ranch.

ment, leaped and by throwing its mouth wide open, buried its terrible weapons in the body of the elephant, and then by pulling back disemboweled it with one motion.

But the elephant was not dead, and its struggles threw the sabre tooth tiger off. The tiger sank into the tar and was caught and in a moment the two were engaged in a life and death struggle. Slowly but surely the tar crept up over them, and their struggles became less and less, and at last they were smothered.

Long ago coyotes, wolves and other animals which gather about wounded animals have assembled at the feast. Venturing in they were caught. Vultures came and met the same fate.

Replace these animals with bison, camels, horses—colts were caught here as late as 1885—and some idea can be formed of how this extraordinary deposit of bones resulted.

One mine worked by a professor of geology in the University of California seemed a solid mass of bones for fifteen feet. In one place a mammoth had been found, on top of this several sabre tooth tigers were piled, together with them, a gigantic sloth, and it was evident that animals of all kinds had been piled in, one on top of another, until there were layers and heaps of tragedies spread out for a quarter of a mile, a trap so gigantic, so full of victims that it can hardly be comprehended.

A stable near these fields has been known to be piled with the bones, big long sloth heads, tusks, etc., representing thousands of animals. The Los Angeles high school students and professors are said to have taken out ten or twelve tons of bones, a mass which will take years to sort out and reassemble, but already a fine series of sabre tooth tigers have been secured from them and mounted.

EUROPE'S FASTEST EXPRESS

By F. C. COLEMAN

THE "Nord-Express" service connecting Paris with Brussels, Berlin, the Baltic seaboard and St. Petersburg, ranks as the fastest train schedule in Europe, and, with 400 tons coach load, the engine attains a speed of 75 miles per hour. By the French Northern Company's route, the distance between Paris and Berlin is 672½ miles and the eastward journey is made in 15 hours 28 minutes, allowing for the difference between west and mid-European time. The 95¾ miles between Paris and St. Quentin is regularly covered in 93, 94 and 96 minutes, while the next run of 53½ miles from St. Quentin to Erquelines—the Belgian frontier station—is booked at 55 minutes. Two engines of a most powerful type have been built for use in this service. Tests are being made as to their actual efficiency. Both these engines are fitted with apparatus for highly-superheated steam. Instead of constructing the ordinary type boiler for saturated steam and placing a water-tube boiler for superheated steam over a simple engine, according to the system of tests at present in vogue, the same system of compounding is here employed, thus narrowly confining the test merely to the relative advantages of the ordinary and the water-tube boiler.

The previous largest engines in Europe are the "Pacific" type of the Belgian State Railways, which have four cylinders. The new Nord engines have, however, two high-pressure cylinders. While steam pressure in the Belgian engines is 200 pounds per square inch, the French engines carry a pressure of 227.5 pounds per square inch with direct admission from the boiler to all the cylinders, whenever it is found desirable for the first turn or two of the wheels when starting. Subsequently, of course, the boiler supplies only the two small cylinders.

These French engines, being very much more powerful in starting effort than the Belgian locomotives, are not only the same weight as the latter, but the boilers of the Nord engines have 23 per cent. more heating surface than the Belgian simple engines. But the chief interest in these new locomotives is the novel solution of the cylinder problem, which for years past has been an obstacle in the design of very powerful locomotives, the difficulty occurring when specially large cylinders are necessary, either for low-pressure saturated steam, superheated steam, or extra low-pressure in one-half of a compound engine. In running order, the engine weighs 102 tons. The tender weighs 56½ tons, so that in working order these "Baltic" locomotives have a total weight on rails of 158½ tons.

HUGE LOCOMOTIVE THAT MAKES SEVENTY MILES AN HOUR ON ITS RUN FROM PARIS TO BERLIN.

A SIMPLE ENGINE FOR GENERATING ELECTRICITY FOR FARM LIGHTING.

ELECTRIC LIGHTS ON THE FARM

By

L. T. PERRILL

AN electric lighting system can be made a paying proposition on the farm. Ten years ago, if a man had said that motor cars would be found on hundreds of farms, there would have been some danger of his having to face a court of inquiry. But as the demand has grown the price has decreased until today many farmers use the motor car for work as well as pleasure. The same will be true of farmers' electric lighting outfits. For demonstrating and experimental purposes, an outfit such as a farmer might care to buy has been installed in the department of electrical engineering at the Kansas State Agricultural College. During the last State Farmers' Institute more than four hundred farmers visited this outfit and listened to the explanations of the means of operation.

Since the perfection of the tungsten lamps, a small lighting plant has been possible. A tungsten lamp has a filament inside the glass bulb made of a metal, tungsten, in place of the carbon which is used in the common electric lights. A lamp with this tungsten filament gives three times as much light for the amount of electricity used as the carbon lamp does. Tungstens cost more than the carbon lamps but they reduce the cost of the battery enough to make them a good investment.

The common rural lighting outfit offered for sale includes a dynamo to generate the electricity, a gasoline engine to run the dynamo, a switchboard, and a storage battery to store electrical energy to be used by the lamps and small motors without running the engine. A good, complete system can be purchased and installed for less than five hundred dollars, not much more than one of the dangerous gas plants cost. This can be lowered if the farmer has a gasoline engine or wires his house, himself. Electric lights will lower the insurance rate because there is not so much danger of fire when they are used as when gas, gasoline, acetylene, or coal-oil lamps are burned.

A one horse-power engine or an additional horse-power to any engine, will run a dynamo large enough for a ten-ampere outfit. A ten-ampere outfit is

satisfactory for the average farm. When the large power is to be supplied by the gasoline engine, the dynamo can be run at the same time, requiring a little more gasoline but no more time. Under such circumstances, the cost of electric lights will be as close to nothing as it is possible to have good lights.

The dynamo, switchboard and battery are shipped ready to set up. In most cases, a good electrician should be secured to install the dynamo and cells and do the wiring. The cells must be watched carefully. Distilled water should be used to fill the batteries. The water must be above the plates at all times. It is advisable to purchase thin boards to separate the plates as any connection, even a flake from one of the plates, will reduce the value of the cells. The battery should be charged and discharged, occasionally, to its full capacity if the demand upon it is not sufficient to do so. If this is not done, it will not work satisfactorily.

THE STORAGE BATTERY THAT SERVES FOR EXPERIMENTAL PURPOSES IN THE KANSAS STATE AGRICULTURAL COLLEGE.

A ten-ampere battery will operate all the lights required for a seven or eight room house as well as lights for the outbuildings. In addition, a small vacuum cleaner, electric toaster, wringer, washing machine, sewing machine, fan, or electric iron can be used.

The farmer, after determining the number and sizes of lights he desires in each room, must estimate the number of hours they will burn in the morning and evening. These figures can be obtained from the number of hours that artificial light is used now. It must be remembered that the electric system should be large enough for the heaviest average load demanded from it, which is sometime in the winter. This does not mean that the battery should have sufficient capacity to run all the lights on the place at one time for any length of time. On special occasions, as parties, the dynamo can be run in parallel with the batteries. A switchboard to permit this should be purchased, always.

The average house with seven rooms, cellars and closets, should burn less than three hundred watts a week. The storage battery of a ten-ampere outfit will produce three hundred watts without recharging. It takes eight hours to charge the battery after it has been discharged, completely.

The cost of wiring the house will vary between forty and one hundred dollars depending upon the amount and grade of wiring and fixtures used. A house can be wired cheaper when it is being built than any other time. The cost of upkeep is slight. At the end of six years, new positive plates for the cells may be required at an expense of one hundred dollars.

Another electric outfit is called the "direct-connected." The generator in this system is connected to the engine directly instead of by a belt as in the ten-ampere plant. A direct-connected system will cost between eight and nine hundred dollars because a special engine must be furnished to obtain an even speed and smooth lights. As there are no storage cells, the engine must be run whenever the lights are used, which would be unhandy in the mornings on a cold winter day. As the generator in this outfit has a higher voltage than the storage battery system, the wires can be strung farther from the generator.

Other systems have been tried as well as combinations of the several types. These two, however, are the most successful for the farmer, with preference given to the storage battery outfit.

A SPIDER WEB ALL SPANGLED WITH DEW.

IF LOBSTERS WERE SMALLER AND SPIDERS LARGER

By

EDWARD F. BIGELOW

IF the spider were larger and edible how attractive it would seem; and if the lobster or crab were smaller and not edible, it would be a repulsive thing. Indeed, the word lobster comes from the good old Anglo-Saxon loppe, a spider. But I suppose there is no subject of natural history, unless it be snakes, for which it is more difficult to win appreciation than for spiders. For a moment eliminate this inherited repulsion, and imagine a garden spider cut in two in the middle, lengthwise, and the two halves served daintily on a platter prettily decorated with sprigs of parsley. Then

SPIDER'S FOOT MAGNIFIED MANY TIMES.

COCOON OF "GOLDEN LADDER" SPIDER.

SPIDER'S TONGUE. GREATLY MAGNIFIED.

what a luscious thing would be our Eperia or Ariadne. No longer would we shudder and keep away from the horrible thing, but would say, "Come, friends, let us gather around the festive board and have a taste of this delicious spider."

But, seriously, is there any reason why a person should not know and admire a spider? Unfortunately, though there are in any locality about three or four hundred species of spiders, only a few have common names because they are absolutely unknown by the so-called "common people." Most of us are familiar with the garden spider, the black spider, the jumping spider and possibly the running spider. But when we have done with these, if we see any big spider we can call it a tarantula because somewhere we have seen a picture of this famous spider, though the true tarantula is a large European wolf spider.

There are few more beautiful objects than a spider's web covered with dew. In symmetry, in perfection of geometrical arrangement, and in the prismatic reflection of color it is a gorgeous object. And consider the wonderful devices that our garden spider has for attending to its toilet. Was ever comb in lady's boudoir more perfect or more attractive than these combs that the spider has at the end of the claws to aid in manipulating the cobweb threads, in clinging to a rough object and as aids in walking over the web?

What an exemplification of the Darwinian doctrine of the struggle for existence is in the silky bag in which the mother spider envelopes her eggs, there to be hatched and to eat one another. She may place within this bag one hundred and fifty eggs while from it will issue only a dozen spiders although every one will be hatched. The strong have eaten their brothers and sisters. The egg-bag shown in one of the illustrations is that of the "golden ladder" spider, often seen in the garden, especially in the early autumn. It spins a large, circular web, usually crossed by a broad

JAWS AND FEELERS OF *Dolomedes*. A WATER SPIDER.

zigzag band of white silk, that gives a striking effect.

It must be confessed that when it comes to the jaws of the spider and the curious palpi we have a formidable weapon of attack whose construction excites admiration. If those jaws were larger and were filled with a luscious lump of meat as with the lobster, they would probably look as attractive as anything on the table. These jaws not only retain the food but give passage to a poison that enters and benumbs the prey. The face, jaws (mandibles) and feelers (palpi) are from a water spider. These spiders are not uncommon, although we seldom see them, perhaps because we do not look. They are found near the water, and some can dive and remain below the surface for more than an hour.

WAGING WAR ON SWAMP LANDS

By

F. G. MOORHEAD

TEN years ago a man bought 640 acres of land in New Madrid county, Missouri, paying $1.25 an acre. Not an inch of the land was visible, the entire section being covered with water, ranging in depth from one to six feet. The neighbors called the man crazy; the investment might turn out all right if he went into the fish business, but so far as farming was concerned, even the primitive Oriental ways of raising rice would not work out here.

But the man was just a little bit shrewder than his neighbors. He was not much interested in the forests of gum and oak and cypress, so dense that it was difficult to push a skiff through. He was looking ahead to the inevitable day when a drainage ditch would be dug along one side of the bog-lake and the section of land at last would be visible. The drainage ditch was dug and six years after the land had been bought for $800 it was sold to an Iowa farmer for $11,200, which is at the rate of $17.50 an acre.

The Iowa farmer likewise saw into the future with the eyes of faith. The land was yet a bog, but the owner dug lateral ditches and made the land dry enough to farm. He cleared it, selling the timber for enough

ONE OF THE DIPPER DREDGES AT WORK ON THE MISSOURI-ARKANSAS DRAINAGE PROJECT.

THE DUCK HUNTER'S PARADISE, WHICH MIGHT BETTER BE DEVOTED TO THE GROWING OF CORN.

to pay the cost of the work. On the first 125 acres thus ready for cultivation he planted a crop of corn between the stumps. The black alluvial soil, enriched by fertilizing elements deposited by the floods for countless years, produced ninety bushels of corn to the acre the first year. Last year the Iowa farmer was offered $41,600 for the land which had sold for $800 nine years before. He refused the offer, although it meant a profit to him of $30,400 on an investment of $11,200 in two years.

Again.

Ten years ago forty acres of inundated land in the same Missouri county likewise sold for $1.25 an acre. It was covered with a heavy growth of oak, gum and elm. Two years ago the timber was sold for $5 an acre on the stump. The land

was drained by means of a lateral ditch and at a cost of $10 an acre was cleared for farming. Last year it yielded seventy bushels of shelled corn to the acre, the crop selling for $1,000. Last fall the owners refused $75 an acre, an increase on the value from $50 to $3,000.

Drainage work is now in progress in the state of Missouri alone which will reclaim a

THERE ARE TWELVE MILLION SUCH ACRES IN MICHIGAN, WISCONSIN, IOWA AND MINNESOTA ALONE.

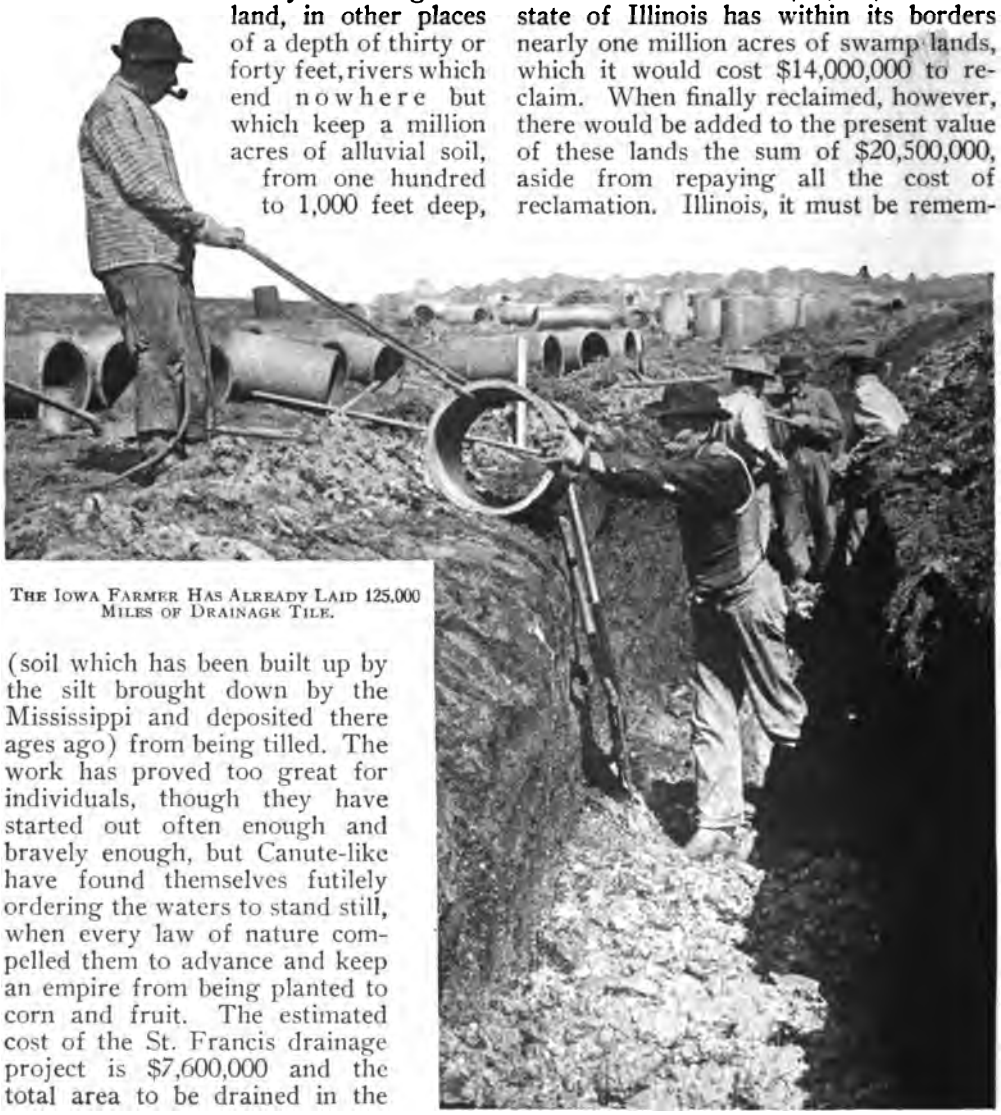
A RECLAIMED SPOT IN HARDIN COUNTY, IOWA, WHICH YIELDED SEVENTY BUSHELS OF CORN TO THE ACRE THE FIRST YEAR.

million acres, enough to provide ten thousand farmers with 100-acre farms; enough to add 75,000 more to the population of the state; enough to increase Missouri's corn yield forty million bushels a year, which at fifty cents a bushel is a matter of $20,000,000 annually; not to be snuffed at, even in these piping times of prosperity. And the cost of reclaiming this empire is estimated at no more than one-half the increased corn yield for only one year. Add to this the 500,000 acres of land destined to be reclaimed in the adjacent swamps of Arkansas and the magnitude of the work now well under way a couple of hundred miles below St. Louis will be appreciated.

At the north end of the great swamp, where it narrows to a width of thirty miles between the Ozark hills and the Mississippi river, six streams that drain 1,100 miles of hill country pour their waters over half a million acres of swamp. To relieve this condition a diversion canal thirty miles long, with an embankment fifteen feet high on the south side, was dug straight east from the hills to the Mississippi three miles below Cape Girardeau, diverting the waters of the six streams to the big Father of Waters. South of this diversion canal the basin of Little River is a flat, swampy bottom ten to twenty miles wide and ninety miles long, so flat and devoid of outlet that it is always under water. In this district fifteen hundred land owners, in six counties, organized the Little River Drainage District under the state law which provides that a majority of the land owners may form such districts. The plan includes the digging of a main channel and floodway eighty-five miles long and six hundred miles of lateral ditches. This will drain all of that vast swamp and conduct the waters into the main canal of the St. Francis River drainage system, which will carry it on down to enter the Mississippi River at Helena, Arkansas. Already forty large dipper dredges are at work on the Little River drainage project, which when completed will cost four million dollars.

But the immense task of reclaiming an empire in the upper Mississippi valley does not stop with the Little River drainage project. Where a half million acres of arable land will be added here, there

remain a million acres to be added by the St. Francis river drainage project, which is the most stupendous reclamation work now under way in this country. The great volume of water which must be carried from the floods in the Ozarks may be imagined from the fact that the St. Francis floodway is planned of sufficient capacity to carry at extreme flow a stream of water 2,000 feet wide and eight or ten feet deep. This water is brought down by the innumerable rivers and streams which originate in the Ozark hills and which spread out over the country in lagoons and lakes, some places barely covering the land, in other places of a depth of thirty or forty feet, rivers which end nowhere but which keep a million acres of alluvial soil, from one hundred to 1,000 feet deep,



THE IOWA FARMER HAS ALREADY LAID 125,000 MILES OF DRAINAGE TILE.

(soil which has been built up by the silt brought down by the Mississippi and deposited there ages ago) from being tilled. The work has proved too great for individuals, though they have started out often enough and bravely enough, but Canute-like have found themselves futilely ordering the waters to stand still, when every law of nature compelled them to advance and keep an empire from being planted to corn and fruit. The estimated cost of the St. Francis drainage project is $7,600,000 and the total area to be drained in the two states is a million acres—an enormous addition to our agricultural lands.

Nor does the work of reclaiming swamp lands in the grain belt end with these two immense projects in Missouri and Arkansas. It is conservatively estimated that the reclamation "of 80,000,000 acres of bogs in the central and eastern portions of the United States would add a value of $1,500,000,000 to these now worthless areas, without taking into consideration the future rise in the value of the lands. For instance, the reclamation of the two and one-half million acres of marsh lands in Wisconsin alone would add a value thereto of $41,000,000. The state of Illinois has within its borders nearly one million acres of swamp lands, which it would cost $14,000,000 to reclaim. When finally reclaimed, however, there would be added to the present value of these lands the sum of $20,500,000, aside from repaying all the cost of reclamation. Illinois, it must be remem-

BIG MONEY IS MADE IN RAISING ONIONS ON A FORMER MISSOURI SWAMP.

bered, already raises more corn than any other state in the union and the lands to be reclaimed would be more productive than any acres now in corn, because of the rich alluvial deposits which have been accumulating for unnumbered years. What this soil would accomplish for the grain belt as a whole puts the wildest dream of Beriah Sellers to the blush, for while Illinois with a million acres of reclaimed swamp lands would find itself twenty million dollars better off, Michigan, Wisconsin, Iowa and Minnesota have approximately 12,000,000 acres of swamp and overflow lands, which at the Illinois ratio, would mean something like $250,000,000 at stake, waiting for the dredge and the canal to add wealth beyond the dreams of avarice to states already rich beyond the imagination of Croesus.

THREE YEARS AGO A BOG. LAST YEAR IT YIELDED SIXTY-FIVE BUSHELS OF CORN TO THE ACRE.
Near Storm Lake, Iowa.

Because the work of reclaiming these vast areas is in progress is one of the reasons why economists predict the day when the grain belt will have practically doubled its production.

THE NATURALIST AND THE SCULPTOR.
Director William T. Hornaday, of the New York Zoological Park, admiring young Fairbank's bear model.

REMARKABLE BOY SCULPTOR

By

LILLIAN E. ZEH

ONE of the picturesque figures at the New York Zoological Park just now is a boy modeling wild animals at close range. He is Avard Fairbanks, and he came out of Utah, with a lump of clay, an absorbing love of animals and a determination to become a sculptor as his stock in trade. Inside the protecting rail of the Lion House, right up against the cages, he sets his modeling stand, and with sleeves rolled up to his brown elbows he molds and digs and pats his clay in the shapes of the huge beasts behind the bars. His ambition is to model wild animals with strict fidelity to their natural postures.

THE TIGER.

Young Fairbanks already knows something about animal anatomy, so that the lumps and bulges that show through the hide of a Siberian tiger, for instance, are no longer things of mystery to him. He has crowded a year's study into six months,

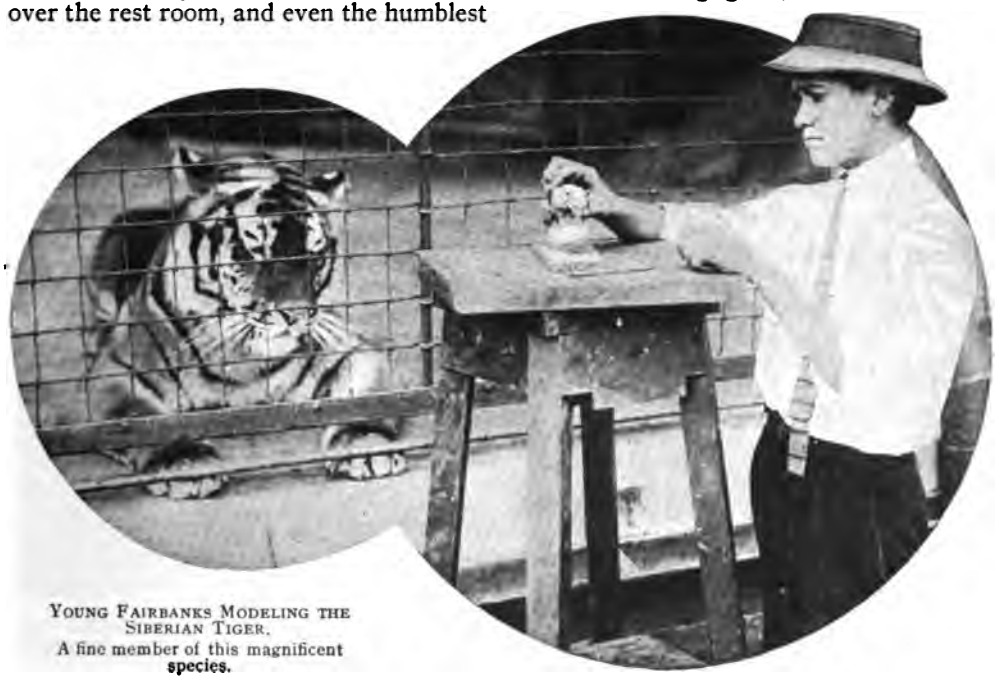
working all day on his animals from a position right before the cages, and attending regularly the night classes at the Art Students' League.

His natural gift for reproducing "action" in groups of fighting animals or those in attitudes of stealthy movement has won for him two scholarships in the classes of the Art Students' League. And he is only fourteen years old. His first scholarship came as a result of his "Fighting Pumas" and the second was won by his "Study of Fighting Panthers." The members of the awarding committee pointed out the crudities of his drawing and certain defects of composition, but the action was there, and it was because of that feature of his work that the prize was bestowed. Correct drawing can be learned, but no amount of study will give a student the ability to infuse a realistic sense of movement into the figures he is modeling unless he has talent to begin with.

THE BEAR.

Everybody connected with the Zoological Park, from Director Hornaday down to the motherly woman who matronizes over the rest room, and even the humblest animal feeder, is interested in the boy who works so earnestly with his clay and little wooden modeling tool in front of the wild animal cages. The tigers, lions, jaguars and pumas themselves seem to regard him with friendly eyes. They often look as if they were consciously posing to assist him in his work of reproducing them.

"It takes me a long while to get a piece finished," said Master Fairbanks, "because I have to wait hours sometimes for an animal to take the pose I'm doing him in. I worked on my tiger and my bear at the same time, so as not to waste any more hours than I could help. The keepers used to give me a loaf of bread for bait. I'd go down to the bear den and flourish the bread around until the bear I wanted ambled down to the front of the cage. He'd pose for me an hour at a stretch sometimes, with the help of a piece of bread. Then, when he got tired I often could get him to come back again by whistling for him and holding up another chunk. But after about two hours of "being good," he wouldn't sit



YOUNG FAIRBANKS MODELING THE SIBERIAN TIGER.
A fine member of this magnificent species.

THE LION NEAR COMPLETION. THE YOUNG SCULPTOR SMILES OVER HIS WORK.

another minute, no matter how much I wished for him, or how much bread I tried to tempt him with. He was through posing for the day, and then I'd go back to the tiger and wait for feeding time, when he would be sure to sit up on his haunches in the position I wanted him.

"I work here almost every day, except Saturday and Sunday. The crowd's too thick on Saturdays to get any work done. They push in on all sides of me, and a couple of dozen children climb up on the railings so close that I can't move my elbows. Mondays and Thursdays are the best working days, for people have to pay to get into the Park and there aren't so many. The ones that watch me just stand quietly and look, but don't interfere. You have to get used to people watching you; after a while you don't mind."

There is no other place in the world that offers such a collection of animals from which sculptors may obtain living models, as does the New York Zoological Park. Few people in the crowd that surges through the fine lion house are aware that a well-equipped studio is a part of the building, designed for painters and sculptors who desire to work from live wild animal models. The room contains a row of lockers, running water and a great cage into which the particular animal which is chosen for the model is brought. This artist's room is used only in winter, the artists preferring to work outside at other seasons.

MASTER FAIRBANKS GOES OUT AMONG THE BISON, WHICH DO NOT MAKE BAD "SITTERS."

BATS TO FIGHT MOSQUITOES

By

ROBERT FRANKLIN

THERE is a man in Texas who has found out a new way to fight the mosquito. His name is Dr. Charles R. Campbell. He is official bacteriologist of the city of San Antonio.

His idea is to employ bats as mosquito-fighters. The neighborhood of San Antonio is especially plagued by mosquitoes—malaria is more or less rife in that vicinity—and for a long time past the inhabitants of the municipality and its suburbs have eagerly sought to find a solution of the problem. Much benefit has been obtained by keeping minnows in cisterns and ponds—these small fishes being greedy devourers of mosquito larvae—but such measures have not altogether met requirements.

Bats, as is well known, are insect-eaters, and are particularly fond of mosquitoes. In the twilight, when they rove abroad, they devour immense numbers of the pestiferous insects—their manner being to dash back and forth through a swarm and gobble the victims up by wholesale.

In view of which fact, it occurred to Dr. Campbell that it might be a good idea to establish in and about San Antonio a number of "bat roosts," as he calls them—that is to say, structures so contrived as to invite bats for sleeping purposes. He has already put up two of them, and proposes to erect others, those already in operation having proved highly successful.

The question which naturally suggests itself off-hand is, on what plan or pattern should a dormitory for bats be constructed? And, again, when once it is built, how are the little winged mammals to be induced to take up their residence in the quarters so kindly provided for them?

An answer to the first of these questions is furnished by the accompanying photograph, which shows one of the bat roosts built by Dr. Campbell in the outskirts of San Antonio. One notices that—as might be expected—it is a very unfamiliar type of structure. Upheld by strong posts at a height of ten feet above the ground, it is secure against invasion by predatory animals of any kind, and an additional protection against cats is afforded by inverted pans of sheet-iron with saw edges surrounding the four supporting posts.

There are no windows, but opportunity of entrance is afforded to the bats by a series of horizontal openings so arranged as to resemble the slats of an ordinary window-shutter. The whole building is thirty feet high, the upper twenty feet being the enclosed portion, and the slatted arrangement runs up each of two sides for a distance of sixteen feet.

Inasmuch as the slats are turned downward at a sharp angle, and only enough

BAT ROOST AT SAN ANTONIO, TEXAS.
The inmates sally forth at night to devour mosquitoes.

space is left between them to admit a bat, the interior is quite dark—an absolute essential, inasmuch as bats do their sleeping in the daytime, and require for the purpose a dark place. Thus it is that they sometimes make themselves a nuisance by frequenting lofts in houses; but of caves they are particularly fond, when they can find them. Unfortunately, in most parts of this country caves are scarce.

This, however, is exactly where Dr. Campbell's idea exhibits itself as practical. His bat roosts are in effect artificial caves, of no great size but big enough to accommodate a large bat population. So admirably are they adapted for the purpose that no artifice is required to attract the bats, which promptly proceed to make use of the quarters provided for them. The roost shown in the picture has been standing only six months, and already as is estimated by Dr. Campbell, 10,000 bats sleep in it every day.

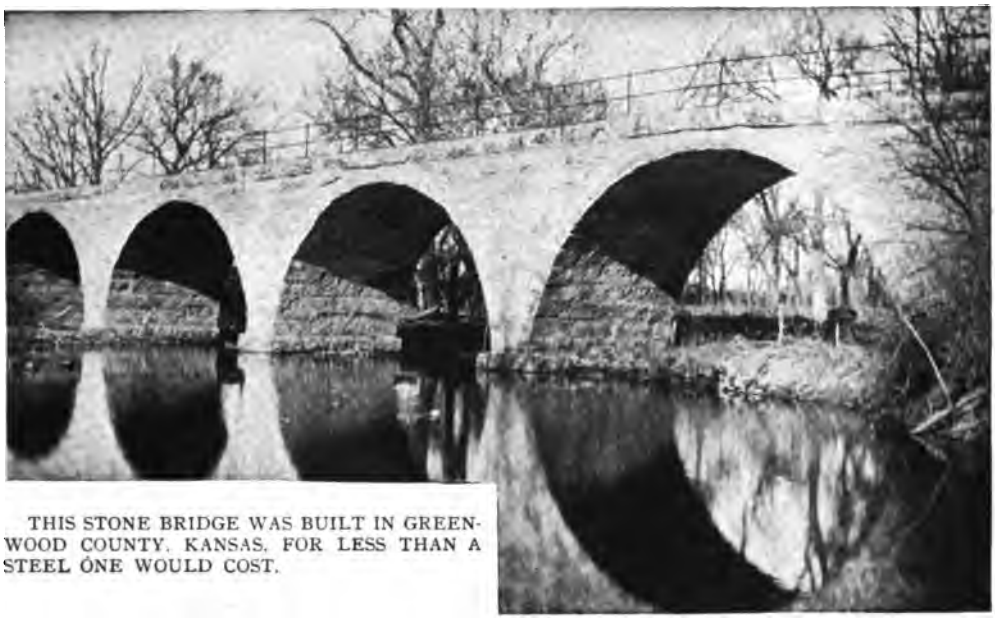
DR. CHARLES R. CAMPBELL.
This bacteriologist of San Antonio is fighting malaria indirectly by means of bats.

A bat's wings are modified hands, of huge size relatively. When the animal goes to sleep, he hangs head downward by his thumbs —that is to say, by two hooks which correspond to our thumb-nails. Hence it is necessary to provide, inside of the structure here described, a series of perches so arranged that bats, thousands on thousands of them, could hang in serried ranks, row on row and tier above tier. Thus accommodated, it is obvious that immense numbers of them could find sleeping room in a space twenty feet high and ten feet square at the bottom. At the top, however, the roost is only five feet square, because its sides slant.

Access to the interior of the roost is had by means of a ladder, through the floor. It may need repairs from time to time. But the main reason for providing means of entrance is to collect the droppings of the bats, which, as most people are aware, are an extremely rich and valuable fertilizer. Dr. Campbell believes that the "bat guano" from his roosts will much more than pay the interest on the money invested in them.

The main object in view, however, is neither to procure fertilizing material nor to afford free dormitory privileges for bats. It is mosquito-killing. If, by the construction of roosts, bats, as is expected, can be induced to multiply in great numbers in the neighborhood of San Antonio, they will wipe out the troublesome insects by wholesale. Such, at all events, is the theory on which Dr. Campbell is proceeding. As one of the health officers of the city, he looks upon the plan as a measure of sanitation—the mosquito being recognized today as a spreader of malaria and other diseases.

It will be noticed that the roosts help the bats, and thereby encourage their multiplication, in two ways—first by providing them with suitable living quarters—which under ordinary circumstances they do not easily find—and secondly by protecting them against the cats and other enemies. Mosquitoes fly only at night, and hence for their destruction the bats are especially valuable.



THIS STONE BRIDGE WAS BUILT IN GREENWOOD COUNTY, KANSAS, FOR LESS THAN A STEEL ONE WOULD COST.

BREAKING A BRIDGE TRUST

By

HARLAN DAVID SMITH

ONE million dollars wasted every year on Kansas bridges! The brand new state highway engineer bumped into that fact before he had been in office six months. Two million for bridges and one-half of it wasted! That, you will agree, was considerable of a leak. To the engineer—an old bridge man himself—it sounded like mighty bad business.

Conscious of his duty in the matter the new engineer left his office one day and went out to look for a million dollars.

And he returned with his discovery—a full grown bridge trust. The newspapers told about it one morning. It was a fine story. The trust, the engineer discovered, was doing business in every county of the state.

The trust, Walter Scott Gearhart, the new engineer, discovered, was simply a combine of bridge companies doing business in Kansas. The state had been divided into districts and every company had a district. When bids for a bridge were to be let, a representative from every company, usually, would put in a bid. But if the bridge was to be built in A—company's district, for example, the A—representative got the contract. His bid always would be lower than the others. If it was in B—company's district, the B—man always happened to have the lowest bid. Mr. Gearhart also charged that when the successful bid was made up it included not only a profit for the bidder but a "rake-off" for each of the other bidders to the amount of a liberal "expense account."

The plan worked easily. Even shrewd county commissioners were duped year after year. Usually, the bids were unreasonable, and the workmanship and material were poor. When Mr. Gearhart came in 1909, the state was full of "tin"

A Wooden Bridge Typical of Many Country Districts.

bridges—cheap steel structures. The enormous cost of repair on them was a very profitable side business for the bridge companies. For example, a bridge was built in Wabaunsee county in 1900 at a cost of $14,000. It was partly washed out in 1903 and reconstructed at a cost of $8,000. In 1907 it was washed out again and rebuilt for $9,000; again washed out in 1910, and again rebuilt for $8,000. That made the cost of this bridge, as it stands today, $39,000. And it would take $25,000 right now, according to Mr. Gearhart, to make it a first class structure. That would bring the total cost to $64,000. A bridge that would not have been washed out could have been built for $35,000, the highway engineer says.

Two Men Were Killed because This Bridge Was Rotten.
The county paid enough in damages to buy two or three concrete bridges.

In one county, Mr. Gearhart's findings showed that a certain bridge company had been building all the bridges at cost plus ten per cent for profit. But never had that company furnished an itemized list of expenditures for a bridge. Going over what specifications were used by the company and making a close inspection of one bridge put up by this company, Mr. Gearhart found a clear steal of $1,000. On his findings the company was sued for that amount and the case now is pending.

To combat such wickedness, the new highway engineer decided upon two courses. One was educational; the other legislative.

Legislatively, Mr. Gearhart decided to work for a new bridge law. The old one was a bungled affair which no one ever had understood. It was a relic of the 60's. It was of use only to the bridge companies, and to them because it was so elastic as to allow nearly anything they cared to do. The new law would provide for state supervision of all bridges. The highway engineer, under the law proposed by Mr. Gearhart, would pass on all specifications for bridges and, with the help of his assistants, superintend the

SEVERAL THOUSAND DOLLARS WERE SAVED IN BUILDING THIS INSTEAD OF A HIGH STEEL BRIDGE.
Concrete bridge in Clark County, Kansas.

construction. These were the main features of the proposed legislation.

Educationally, the campaign was a success. Mr. Gearhart talked bridges and roads, too, everywhere—in country schoolhouses, court rooms, churches, opera houses, dance halls, skating rinks—anywhere a crowd waited for him. In the summer he talked bridges at grange picnics, old settlers' reunions, Fourth of July celebrations, chautauquas, and county fairs.

Getting the cooperation of county commissioners in some counties Mr. Gearhart built concrete bridges and culverts and then pointed at them, or pictures of them on a screen, while he talked. Concrete illustrations, you understand. He gave prices and showed what a saving a good bridge meant, though the first cost was a little more.

EXCEPTIONALLY LONG FOR A SPAN—SIXTY FEET—BUT SAFELY REINFORCED.

SUCH A CONCRETE BRIDGE AS THIS ADDS TO, RATHER THAN MARS, THE BEAUTY OF THE LANDSCAPE.

THE BRIDGES OF KANSAS' STATE HIGHWAY ENGINEER ARE STRONGLY REINFORCED WITH STEEL.

About the first bridge Mr. Gearhart built was down in Clark county. The Clark county commissioners were just getting ready to let a contract for a big steel structure which would span one of these creeks. It was to be high above flood marks, consequently it would be an expensive bridge. It looked mighty good to the bridge trust. But on account of its height the approaches to the bridge must be steep, and that would prevent heavy hauling. The commissioners did not wish to make hauling any more difficult, neither did they care to put in a low bridge for the high waters to play with.

In the dilemma somebody suggested

that the new highway engineer at the agricultural college be asked about it. Reluctantly, the "college man" was questioned in a letter. Mr. Gearhart answered all the questions when he arrived at the site of the bridge a few days later. He took in the situation at once and recommended a low concrete bridge about six feet high. A bridge of that sort, he told the commissioners, would withstand the high waters; the drift would float harmlessly over it, and it would be on a level with the road. The high waters lasted only a few hours a year, he reminded them. Wouldn't they rather pay a few thousand dollars less for a permanent bridge of that sort than buy an expensive steel one which would be inefficient and require repairing?

THIS TYPICAL "TIN" BRIDGE WAS WASHED OUT THREE TIMES. Repairs cost $25,000.

Having never heard of such engineering before, the commissioners were a bit dubious. It required a good deal of argument on the part of the "college man" to convince them. But they yielded, finally, though still doubting, and Clark county got its first low bridge. Now it has many of them. It was just the type of bridge that county needed. The "tin" bridge trust lost thousands of dollars in that county as a result, and in neighboring counties, too.

The highway engineer being only an adviser can give information, draw plans and specifications, and superintend construction only when asked.

Down in Coffey county, the first of this year, the commissioners desired to build a bridge across Tequas Creek. They advertised for bids and when the lowest bid exceeded $3,000, a farmer, William Bitts, made a "roar." He had plans made for a concrete bridge, designed to last for a century or two, contracted himself to erect this bridge, hired farm hands to do the work and put in his bill. The bridge is a fine one which will stand for ages and the total cost to the county was $665.65.

Martyrs there have been too, for the cause of better bridges in Kansas. Not until Howard Lamb and Ben Reid were killed when their traction engine went through an old wooden bridge did Marshall county waken to the realization that many of its bridges were death traps. Lamb and Reid died because a neglected bridge had rotted. But Mashall county learned a lesson. In the damage suits the county lost enough money to pay for two or three good bridges.

With the legislature Mr. Gearhart and his supporters have not been so successful. The trust defended itself from the lawmakers last year. The bridge bill was defeated.

But with the agricultural college behind him and with the support of Governor Stubbs, who pledged himself only a few days ago to help oust the trust, Mr. Gearhart is confident that the next legislature will pass a good bridge law—one that will provide for state inspection of plans and bids at least.

HEALING WITH DRY AIR

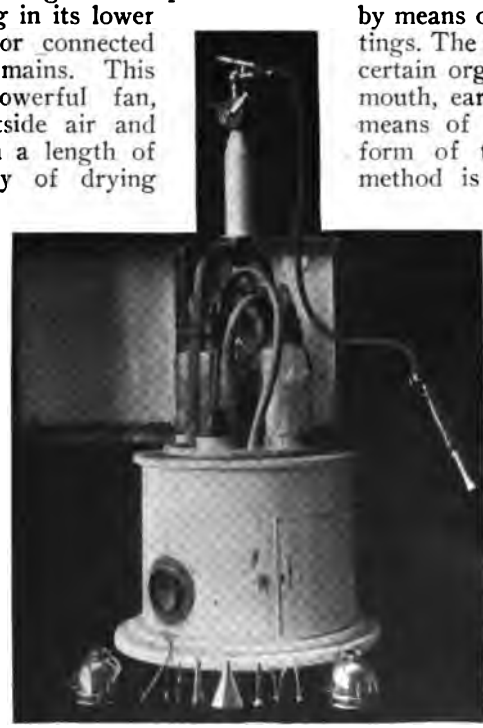
By

DR. ALFRED GRADENWITZ

THOSE who have ever lived in the tropics cannot have failed to notice the extraordinary rapidity with which the healing of wounds occurs in those regions. This striking fact must be put down, not to the heat, but to the extreme dryness of the air, which practically no bacteria are able to resist.

It occurred to a German practitioner, Dr. R. Kutner, director of the Empress Frederic Hospital at Charlottenburg, Germany, that these curative virtues could be utilized anywhere, by applying to a wound or lesion a current of dried air. He therefore designed a special apparatus comprising in its lower part an electro-motor connected to the electrical mains. This motor drives a powerful fan, drawing in the outside air and throwing it through a length of hose into a battery of drying bottles located in the upper part of the apparatus. These bottles contain liquid paraffin, calcinated pumice-stone, impregnated with sulphuric acid, and some bars of caustic soda. An additional bottle is provided for imparting to the dried air, whenever desired, a specific therapeutic effect by the vaporization of these medicinal substances.

The dry air leaving this battery is led by means of a double-way cock, either into a vessel containing ice or refrigerating mixtures or into a metal cylinder containing electric radiators, the temperature of which is adjusted by a regulating lever. The output of the apparatus is controlled by a special lever connected to a valve which receives any surplus air. The temperature of the air is given by a thermometer. An India rubber tube fixed to the discharge opening of the cylinder terminates in a handle to which one of a set of readily exchangeable fittings is applied. For treating the skin and wounds, rose-shaped nozzles are used, whereas inhalation into the mouth or nose is effected by means of masks and glass fittings. The mucous membranes of certain organs such as the nose, mouth, ears, etc., are treated by means of tubes adapted to the form of the organ. The best method is to apply the air in the form of a shower-bath. As the caustic soda used for the definite dessication of the air current is dissolved in moist air, the dryness of the air can be checked perfectly, which greatly adds to the usefulness of the apparatus.

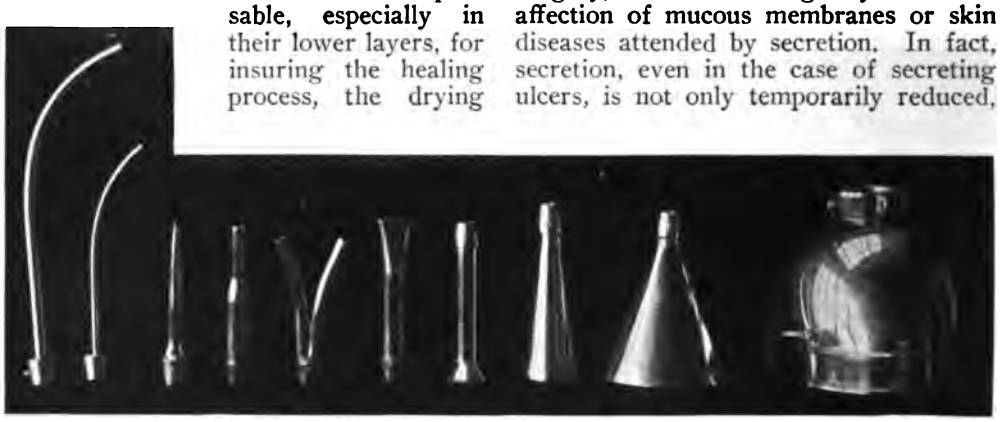


THIS APPARATUS PRODUCES A CURRENT OF DRY AIR WHICH BACTERIA ARE UNABLE TO RESIST.

The amount of air on which the rapidity of healing effects obviously depends is determined by the output of the motor and fan. Dr. Kutner succeeds in

raising it up to 20 liters per minute or 1,200 liters per hour. Such enormous quantities of air, which, by the way, can be readily controlled, will insure a most rapid drying even at ordinary temperatures. Owing to the rapid vaporization of any moisture, the patient only has a feeling of freshness even at very high temperatures 50 degrees centigrade and more. As moreover, a certain moisture of the tissues is indispensable, especially in their lower layers, for insuring the healing process, the drying should not be driven too far. The most advantageous condition, as determined by the amount of air and its temperature in each case depends on the object to be treated. The skin thus demands a different temperature from the mucous membranes situated in the interior of the body. The bactericidal power of refrigerated air might be advantageously combined with the healing virtues of dry air.

This new method is not limited to the healing of wounds, but will be found of the utmost value in the whole field of surgery, and in treating any catarrhal affection of mucous membranes or skin diseases attended by secretion. In fact, secretion, even in the case of secreting ulcers, is not only temporarily reduced, but definitely discontinued, thus insuring a perfect cure without any other treatment.



DIFFERENT FORMS OF NOZZLES FOR APPLYING DRY-AIR SHOWER BATHS.

The cardinals of character are the four requisites: truth, kindness of heart, honor, right feeling. It does not follow that because a man has polish he has real culture. A man who has a noble character will perform noble actions. He may know nothing about manners, but he will make no mistake. Be the man and you will know how to act. Character is native ability; manners mean discipline. We must not neglect the discipline but we must first have character.

—Dr. A. C. Schumacher.

THE WRECK OF THE TWENTIETH CENTURY LIMITED, MARCH 13, NEAR POUGHKEEPSIE, N. Y
A broken rail threw five cars upon the frozen Hudson River. The broken rail may be seen on the left of the photo.

TEMPTING DISASTER BY RAIL

By

ROBERT G. SKERRETT

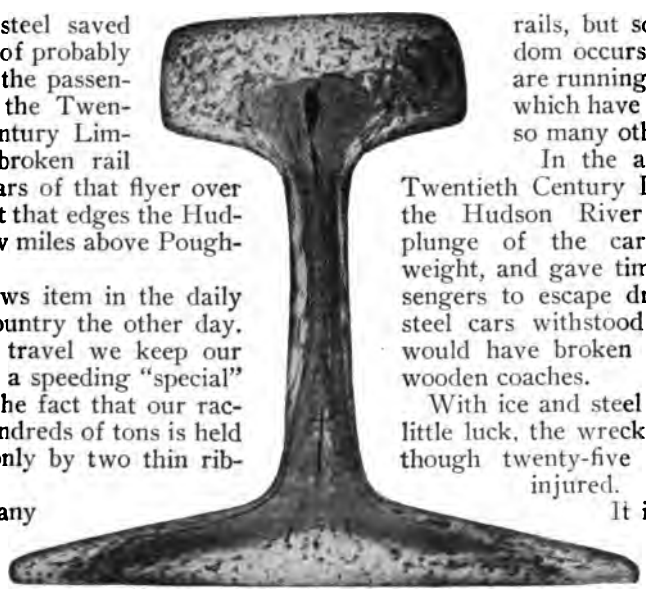
"ICE and steel saved the lives of probably most of the passengers of the Twentieth Century Limited when a broken rail snapped five cars of that flyer over an embankment that edges the Hudson River a few miles above Poughkeepsie."

So ran a news item in the daily press of the country the other day. Yet when we travel we keep our seats calmly in a speeding "special" indifferent to the fact that our racing train of hundreds of tons is held to its course only by two thin ribbons of steel.

Of course many disasters have happened—hundreds of them, in fact—because of breaking rails, but somehow it seldom occurs to us that we are running the same risks which have proved fatal to so many others.

In the accident to the Twentieth Century Limited, ice in the Hudson River stopped the plunge of the cars, bore their weight, and gave time for the passengers to escape drowning. The steel cars withstood a shock that would have broken and splintered wooden coaches.

With ice and steel and perhaps a little luck, the wreck killed no one, though twenty-five persons were injured.



SECTION OF A FINISHED RAIL.
It has been etched with chemicals to bring out inequalities of composition due to faulty treatment of the ingot. The very dark spot indicates "pipe"—explained in the text—This rail has been rolled from imperfect material and would soon break in service. This is an excellent example of one of the causes of railroad wrecks.

It is said that the steel corporation recently refused to guarantee its rails. To this refusal is at-

tributed the action of J. J. Hill in giving an order for 70,000 tons of rails to an independent manufacturer who would make such a guarantee.

According to a statement made recently to A. R. Ewald, engineer of the Illinois railroad and warehouse commission, 200 broken rails were discovered during January on one division of one of the roads operating in Illinois and Wisconsin. In each case the break was detected by the block signal.

We are told that cold weather is responsible for just such accidents as this, and we are given to understand that climatic conditions have called a halt in the chemical constitution of the higher grades of steel rails. We are informed that the steel has become brittle with its increasing hardness, hardness being desired in order to resist wear, and, as a sample, the rumored fracturing of nine hundred rails through the pounding of a single flat wheel on a freight car is cited for our enlightenment. We are not told, however, what was the nature of the steel where these breaks occurred, and we are left to infer that the metal was in every physical sense sound. But there is every probability that the steel was defective, and that it was of a grade or quality that should never have been rolled into rails that were to be laid upon the main line of any road. This subject has been purposely befogged by technicalities, and an air of mystery has studiously been fostered about the making of steel, but there are some fundamental, simple things which any layman can understand—simple things which explain just why bad steel exists and how it comes to be rolled into rails.

The root of the trouble is what is known as the ingot, that is, the big block into which the steel is cast before it is rolled into any of the shapes demanded by commerce.

Rail ingots are masses of metal weighing anywhere from two to three tons, they may be from eighteen to twenty inches square at the bottom—tapering slightly toward the top, and standing sometimes fully five feet high. These dimensions depend upon the number of rails to be rolled out of each ingot, and the refinements of size and form being again regulated by the particular facilities and practices of each mill.

The molten metal is poured into cast-iron molds, and the ingots so formed remain there until the steel has solidified sufficiently to permit these big blocks of outwardly red-hot metal being handled without much risk of their breaking apart and spilling their still liquid contents. The manner in which these ingots are treated up to the time that they become solid throughout has a great deal to do with the ultimate degree of soundness of these blocks. If the ingots be toppled over or laid upon their sides before they have "frozen," as the steel man puts it, then a bubble or cavity forms inside of the mass which constitutes a defect, and which can not be removed subsequently by rolling, even though the surfaces of the cavity may be brought together in intimate contact — there remains always a line of half-born frac-

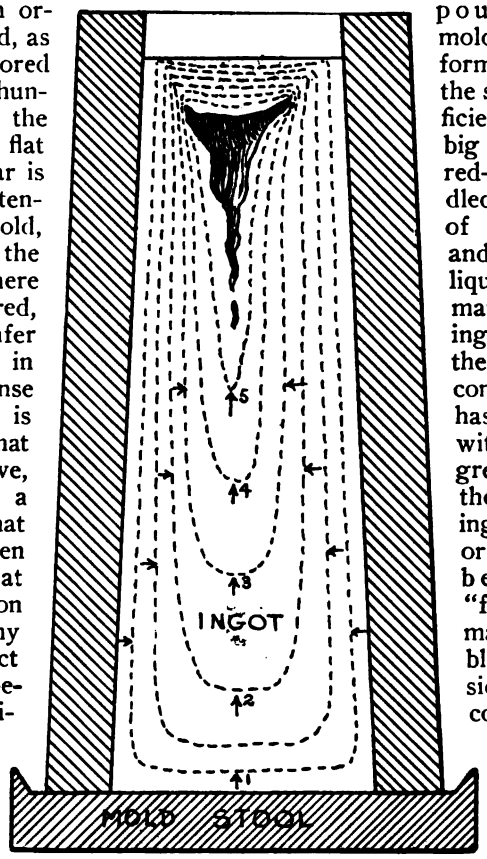
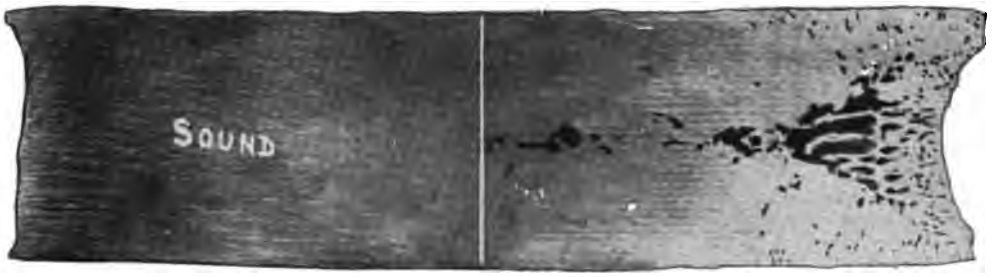


DIAGRAM SHOWING METHOD OF CASTING STEEL INGOTS IN IRON MOLDS.

The dotted lines indicate the progressive solidifying of the steel, and the small arrows point the direction and the stages of the "freezing." The "pipe" cavity is the result of an insufficient quantity of molten metal to fill the final hole caused by the total shrinkage of the mass.



A RAIL INGOT AFTER GOING THREE TIMES THROUGH THE ROLLS.
This ingot has been split lengthwise through its middle. The right half shows the formation of the "pipe" cavities.

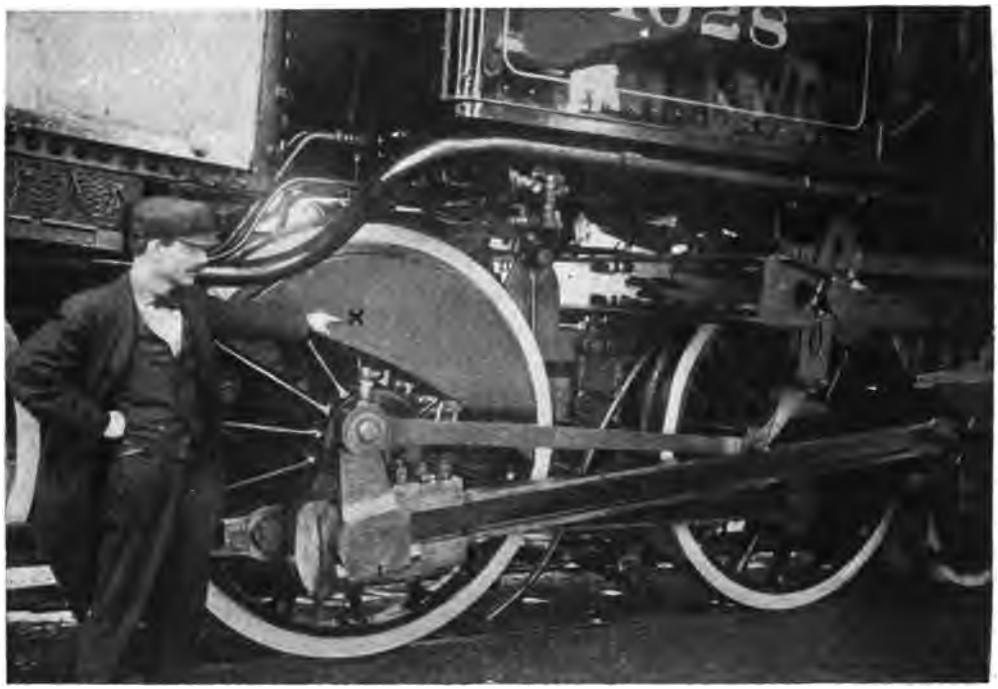
ture which will develop under service stresses.

There is another cause for the formation of this cavity or "pipe," as it is technically termed: the origin is due to a shrinkage which steel undergoes in passing from the molten to the rigid or solidified state, and this is the most fruitful source of the blemish which endangers the soundness of the rail. The steel contracts roundly quite eight per cent. in passing from its melted to its solid condition, and this contraction takes place progressively from the instant the liquid steel touches the cold walls of the encompassing mold, but the top of the ingot is the last to "freeze."

LOCOMOTIVES OF THIS SIZE POUND HARD UPON THE RAILS.

Bear in mind that any given quantity of the melted metal occupies more space in that state than it will when set or rigid. The filling of the mold takes but a few seconds, and, at once, the steel touching the mold walls chills, thus providing a skin or covering for the molten steel inside of it which has yet to shrink. This coat or skin will contract but very little more in passing to its ultimate condition, but it is even then far too large for the shrunken state of its contents when they shall have become likewise set. Therefore, there comes a time when this internal shrinkage results in the formation of a cavity or a series of cavities extending from the top of the ingot downward into

AN INGOT AFTER IT HAS PASSED NINE TIMES THROUGH THE ROLLS—NOW CALLED A "BLOOM."
Observe how even this squeezing fails to obliterate the "piped" or defective portion. The little circles show where the "bloom" might be cut and deceptively appear to be sound.



THE CROSS OR "X" MARKS THE COUNTERBALANCE SEGMENT IN ONE OF THE SIX BIG DRIVING WHEELS OF A 100-TON LOCOMOTIVE.
These are the weights that deal the hammer blows upon the rail. Only sound metal can survive this battering for any length of time.

its body. This is the normal formation of "pipe." Upon the surface of this "pipe" there is a dark deposit or oxide, where the metal has been affected while still hot by the air. This oxide effectually prevents the welding of the surfaces together so as to accomplish a union of the neighboring crystals of steel. The depth or extent of the "pipe" depends principally upon two things, the amount of carbon and other needful alloys as well as the temperature at which the molten metal is teemed into the molds. The greater the percentage of alloy the lower the melting point and the longer the steel takes in reaching the solid state, because the impulse to "freeze" is stimulated to quicker action at one stage by the higher temperature of the metal. In effect, it is akin to the difference in remaining velocity which a rolling object has after coasting down two hills of the same length but of different grades. The longer the steel is in passing from the liquid to the solid condition the greater the depth, although not the volume, of the "pipe" cavity; and the higher the temperature of the steel when teemed into the mold the greater its fluidness and the easier it is for the alloys to flow upward and to localize disproportionately in the neighborhood of the "pipe."

This concentration of the alloys is called the "segregate," and is undesirable steel. Therefore neither the "segregate" nor the "pipe" should be rolled into rails —especially into those rails which are expected to support fast trains and heavy traffic.

There is another blemish in steel which consists in the presence of granules of slag, and there is also the defect which is known as blowholes—really bubbles of gas which have been caught in the solidifying steel. To a very large extent these troubles can be got rid of by the sacrifice of a little time.

In France, the average of breakage is one out of every 2,000, and in Germany the rate is something like one out of every 1,150. This is far beyond the endurance here.

BENDING A STEEL BAR WITH THE LITTLE FINGER

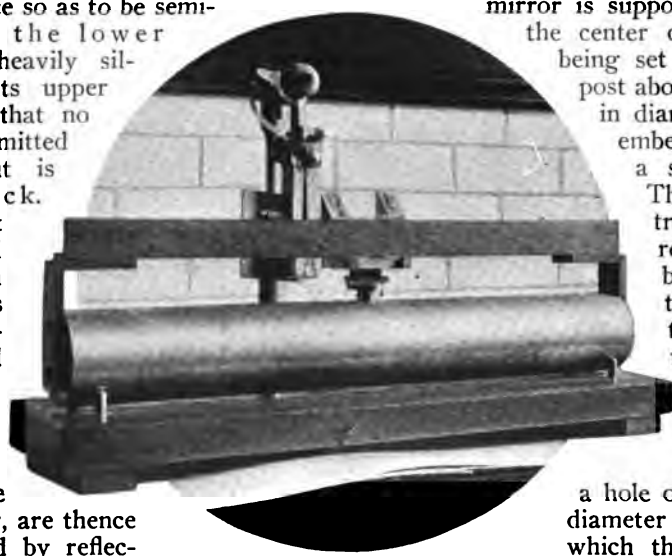
By

ROBERT A. SANBORN

A BAR of steel is commonly regarded as a symbol of rigidity, as a thing that defies any such petty force as the pressure of a finger to change it in the slightest degree. And no human eye unassisted can detect that so small a fraction of energy has any effect on the bar. Apparently it is as straight as before the puny effort. Nevertheless it is a matter of demonstrable fact that the bar can be bent by no greater force than you use to affix a postage stamp to a letter, bent exactly as a strip of whalebone is bent by a like pressure.

To assist the eye in appreciating this fact a simple piece of apparatus is used known to physicists as an interferometer. This consists of two small mirrors which are exactly parallel and placed so close together as to seem almost in contact. The upper mirror is thinly silvered on its lower surface so as to be semi-transparent, the lower mirror is heavily silvered on its upper surface so that no light is transmitted through but is reflected back. Rays of light directed down upon the mirrors pass downward through the upper one, strike the reflecting surface of the lower, are thence sent upward by reflection, and colliding with the rays that are coming down from the source, produce concentric circles of light and dark aspect. The dark circles are those of no light motion, that is, where the mingling of the downward direct light waves and the upward reflected ones neutralize the motion of each other; the light circles are caused by double reflection, that is, where some of the light reflected from the opaque mirror is reflected in turn from the semi-transparent surface above, and back again from the lower surface. These light circles are known as interference fringes.

In this demonstration a bar of machinery steel two feet long, and three and one-half inches in diameter, is supported at each end by four brass pegs, so that the bar is lifted about half an inch from the table. The mirrors are about a quarter of an inch thick, and a little more than an inch square. The lower opaque mirror is supported firmly on the center of the bar by being set upon a metal post about half an inch in diameter which is embedded in the bar a short distance. The upper semi-transparent mirror is stably held by an angle iron that is attached to either end of the bar. Up through the support of the upper mirror runs a hole of half an inch diameter down through which the light passes from a helium tube a little distance behind the



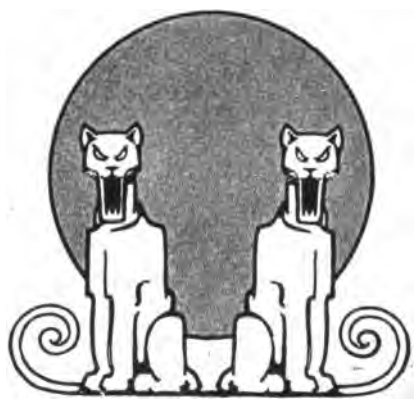
WITH THIS MACHINE, THE PRESSURE OF THE FINGER ON AN IRON BAR MAY BE SHOWN.

bar. The rays are first screened through a plate of ground glass and then meet a slanted plate of clear glass from which some of them are reflected upon the mirrors.

When the light is flashed on and you look down through the hole upon the mirrors, you see in the center a core of yellowish light, around that a dark purplish circle which marks the interference of the direct and reflected waves of light, then a circle of the yellow, the interference fringe, then the beginning of another dark circle. Now you, the sceptic, press your finger firmly down on the middle of the bar. What you see is this. The concentric circles of light and dark move in toward the center, from out beyond the limit of vision come first one interference fringe and then another. If you bear down very hard with both forefingers more circles will pass inward to the center, just the reverse of what you see when you throw a stone upon the surface of a pond. You are convinced now that you have actually bent the heavy steel bar with one frail forefinger, because the bar being rigidly supported at the ends, its position can only be changed at the middle, and from the middle gradually less and less as it nears the ends. The explanation of the mechanical movement of the fringes is readily understood by the lay observer. As the middle of the steel bar is depressed and the mirror with it, more and more of the surface of the mirror is exposed to the light, and more fringes come into view.

If you are interested in knowing just how much you have bent the bar you have to turn to your scientific friend who is conducting the demonstration. He tells you that the passing of one fringe indicates that the lower mirror has been moved about one-half a wave length or fifty-nine one-hundredths of a micron, and that as you have seen two fringes pass inward that you have actually bent the bar about one micron or one thousandth of a millimeter, or about one twenty-five thousandth of an inch. Not very much, it is true, and quite unappreciable to the eye but still, as the interferometer mirrors have proved to you, a measurable amount.

To the philosophic mind this experiment may be interpreted to show that the consequences of one's acts are far more considerable than one supposes, and that the slightest motions and efforts produce effects that are altogether unknown to the actor. To the scientist this application of the interferometer mirrors, here merely used in the way a popular lecturer uses pretty experiments to open the minds of his audience, lends itself to practical use to measure extremely small degrees of deformation. A ray of light by this method becomes a natural micrometer of the greatest perfection, particularly calculated for the determination of such infinitesimal degrees as escape all other means of measurement.



GOVERNMENT RUNS RAILROAD TO BUILD BIGGEST DAM

By

RENÉ BACHE

ON THE LINE OF THE BOISE-ARROWROCK RAILROAD IN IDAHO—BUILT. OWNED AND OPERATED BY THE FEDERAL GOVERNMENT.

RECENTLY the United States government undertook to build a big dam at Arrowrock, Idaho, for the purpose of irrigating several hundred square miles of what hitherto has been desert. At least 1,000 men will be employed on the work for a period of about six years. They must have some means of transportation to and from Boisé, which is twenty-two miles distant, and immense quantities of cement and other materials for construction must be fetched to the dam site—not to mention food supplies, etc.

As a result the government has built a railroad from Boisé to Arrowrock. Uncle Sam not only built it, but he operates it and even prints the tickets that are sold to passengers.

This railroad, recently finished, is already a very busy line.

The Arrowrock Dam will be a remarkable structure. It will be the highest dam in the world. The much-talked-of Roosevelt Dam, in the Salt River Valley of Arizona, is 280 feet high. The great Shoshone Dam, in Wyoming, is 328 feet in height. The height of the Arrowrock Dam will be 351 feet, from its base to the roadway that will run along its top.

The structure will extend across the narrow and precipitous canyon of the Boisé River, twenty miles above the city of Boisé. It will have a curved form, the better to resist the flow of the stream, and will be literally dovetailed into the mountains on either side. The roadway along its crest will be one-fifth of a mile long.

The exploratory drills of the engineers went down ninety feet below the bed of the river before they struck the solid granite bed rock. Inasmuch as the dam must of necessity rest directly upon this bed rock, it will be requisite to remove all the material lying above it, amounting to 225,000 cubic yards. In other words, a hole must be dug in the river bed ninety feet deep and an acre in area.

To accomplish this, it will be necessary

MAIN IRRIGATION CANAL.
This—on the Boise project—with a capacity of 2,700 cubic feet of water per second, is the largest ever built by the Government.

CARRYING STRUCTURAL MATERIAL OVER THE LINE OF THE GOVERNMENT'S NEW RAILROAD.

DIGGING FOR THE BIG SPILLWAY OF THE ARROWROCK DAM ON THE MOUNTAIN SIDE.

first to get rid of the water temporarily—which will be done by boring a tunnel through the mountains on one side of the stream in such a way that the latter shall be diverted bodily and carried around the dam site, returning to its bed a short distance below. The tunnel, it will be understood, will have somewhat the shape of a horseshoe.

A conspicuous feature of this new project is the main irrigation canal, which, lined with concrete, starts eight miles from Boisé, and extends down the valley for a distance of thirty-four miles. It is the largest irrigation canal ever built in this country, having a carrying capacity of 2,700 cubic feet per second—equal, indeed, to that of a fair-sized river.

During the progress of the work the canal system will be extended to cover some 240,000 acres of exceedingly fertile land in the neighborhood of Boisé. As may well be realized, the whole scheme is one of great economic importance, the region to be watered being one of the richest in the world, in respect to its agricultural possibilities. In the Boisé Valley, farming, chiefly for fruit and garden truck, is conducted on highly scientific principles, and land sells all the way from $100 to $3,000 an acre. The potatoes are wonderful in both quality and yield. All through the valley trolleys are being rapidly extended, with stations at short intervals for the passenger and freight convenience of the farming population.

Simultaneously with all this, the Reclamation Service has started to build a dam on the Rio Grande River one hundred miles north of El Paso, which will store more than twelve times as much water as the Arrowrock Dam. It will create the largest artificial lake in the world—forty

miles long, from one to five miles wide, and two hundred feet deep.

The structure, 265 feet high and 1,400 feet long on the top—which is to carry the roadway—will be adequate to restrain the largest flood ever known in the turbulent Rio Grande. It will hold back the waters at the flood season, which hitherto have been wasted, and will store them for use when needed in the dry months of the year.

There are no public lands in Texas, and so Congress was obliged to pass a special bill admitting that state to the benefit of the Reclamation Act. Also it was necessary to make a treaty with Mexico, in order that citizens of that country, on the south side of the Rio Grande, might be guaranteed their share of the water stored by the contemplated dam. All this as a preliminary to the undertaking of the enterprise, which is expected to prove vastly advantageous to the whole of that section.

Even with so much accomplished, however, the location of the international dam site, as it might be called, was a very difficult problem to solve. The Rio Grande does not stay in one place all the time, like other rivers. It moves about in a restless sort of way, changing its bed every now and then and picking out a new channel. But at length the engineers found a satisfactory place between two mountains—a point where rises a rather remarkable elevation known as Elephant Butte, for the reason that from one point of view it has somewhat the shape of an elephant.

Here was the site selected for the Eagle Dam, as it is called. The water it stores in the enormous lake above described will be used for irrigating a strip extending along the Rio Grande River for about 100 miles. Fruit and grain will be the principal crops. The dam will be finished in about six years. But, in addition, there will be four diversion dams, to turn the waters into immense canals by which it will be distributed over 180,000

AT THE BEND OF THE RIVER, IN THE BACKGROUND, THE ARROWROCK DAM WILL TOWER.
Its height is to be 351 feet, the loftiest structure of its kind in the world.

THE BOISE DIVERSION DAM FOR CARRYING THE WATER OUT OVER THE LANDS TO BE IRRIGATED.

acres. To carry the requisite material for the structure and supplies for the army of men engaged in building it, the Santa Fé Railroad has already connected the dam site with its main line by nine miles of track.

The big premiums of life go to skill, and skill is the first born of the ideal. Skill is the child of passion—carried with patience, borne with pain, and suckled into stature through many toilsome days. The great man is strong; the great man is skilled: not flawless — always human—but strong and skilled.

—RICHARD WIGHTMAN.

BUGS THAT PREY AND ARE PREYED UPON

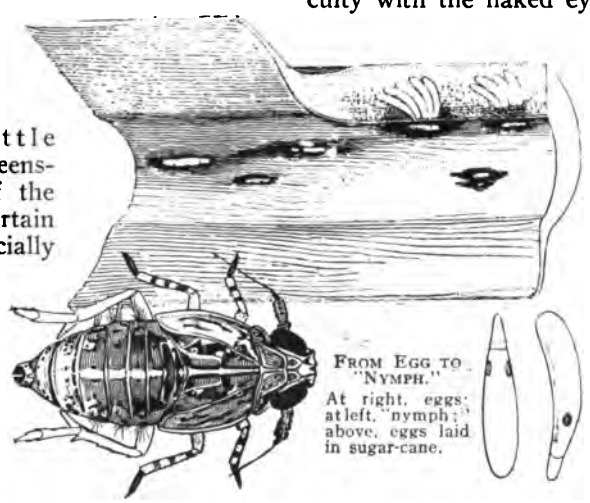
SUGAR-CANE LEAF-HOPPERS.
Upper, male; lower, female.

By HALL ROGERS

REPORTS from Hawaii indicate that the devastations of the dreaded sugar-cane leaf-hopper have been effectually checked by two small parasitic enemies introduced for the purpose from Australia.

The leaf-hopper is a tiny greenish insect, only one-sixth of an inch long, and resembling a cicada in miniature. It was first noticed in 1903, in the cane fields, when already it was sufficiently numerous to prove a serious pest. Since then it has caused a loss of $3,000,000 to $5,000,000 per annum.

Investigation proved that the bug had been accidentally imported from Queensland, in cane cuttings used for "seed"—the habit of the female being to lay her eggs beneath the skin of the joints of the sugar-cane stalks. It was ascertained, however, that the insect did comparatively little damage in Queensland, because of the presence of certain enemies — especially two very minute flies, which lay their eggs in the eggs of the leaf-hoppers, thus destroying them.

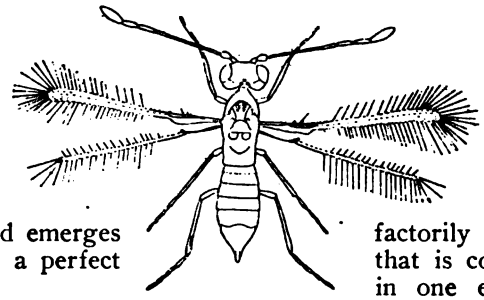


FROM EGG TO "NYMPH."
At right, eggs; at left, "nymph;" above, eggs laid in sugar-cane.

Some thousands of leaf-hopper eggs thus parasitized were collected in Queensland and shipped to Hawaii, where the little flies were hatched out from them and liberated in the cane fields. They promptly attacked the hoppers, and multiplied with extraordinary rapidity—so fast, indeed (it is reported), as to soon reduce the numbers of the injurious insects to a point where they were no longer a serious pest.

The female leaf-hopper deposits her ova beneath the skin of the mid-rib of the leaves of the cane and at the joints of the stalk. Having made a puncture for the purpose, she lays half-a-dozen eggs in it, and then repeats the performance in another place, stowing away in this fashion a number of egg-clusters. The hostile flies—so minute as to be seen with difficulty with the naked eye—run about on the cane looking for the scars made by the hoppers. When one is found, the fly thrusts her ovipositor into the cavity, and "stings" each hopper egg in turn. That is to say, she penetrates the shell of each egg with her instrument, and deposits inside

of it one of her own eggs. From the latter is hatched, later on, a little grub, which goes through the chrysalid stage inside of the hopper's egg, and emerges twenty days later as a perfect winged fly.



THE PARANAGRUS FLY, WHICH DESTROYS THE LEAF-HOPPERS.

The young leaf-hoppers are a good deal like the adults, except that they are much smaller and wingless. While growing, they suck the sap of the sugar-cane, thus draining the vitality of the plant. They become adult in about five weeks, acquiring wings. At times they migrate by flight, after the manner of the devastating locusts. Cane planters in Hawaii speak of "clouds" of hoppers filling the air and extending for miles.

The problem of subduing insect and other pests that prey upon man's fields and orchards seems to be one that will never be satisfactorily solved. A creature that is comparatively harmless in one environment suddenly develops into a startlingly destructive menace when transferred, whether by accident or design, to another clime. It will be recalled in this connection how the harmless rabbit became a deadly enemy to agricultural interests when introduced into the plains of Australia. So it is with winged migrants, which often multiply under new conditions out of all proportions to the previous fecundity of their species.

WIND POWER ELECTRIC PLANT

By

J. B. VAN BRUSSEL

AN interesting example of the employment of wind power for the generation of electricity is being given at Bromyard, Worcestershire, England.

A plant has been installed that is provided with a wind turbine for electric driving. The wheel is 24 feet in diameter, and is mounted upon a steel tower 75 feet high. The generator is placed in a small house at the foot of the tower, and the battery and switchboard are in another small structure. The current is conveyed from the generator at the foot of the tower to the battery by means of bare, solid, overhead, copper cables, carried on porcelain insulators mounted on poles, in connection with which lightning arresters are fixed.

THE WIND TURBINE AND TOWER FOR GENERATING ELECTRICITY.

As it was desirable to have the whole of the control arrangement in the battery room, where the switchboard is, a separate field wire was placed on the transmission line along with the other conductors. This, also, is a bare copper wire, carried on insulators.

The battery consists of 28 cells having a discharge capacity of 46 amperes for 10 hours. The battery is divided into equal groups, either of which can be used for supplying illumination. The pressure on the lamps is 25 volts, Osram lamps being used. Arrangements are made for using 50 volts for power, as

A CIRCULAR SAW BEING OPERATED BY POWER GENERATED BY WIND TURBINE.

the plant, in addition to running the lights in the house—about 100 in all—also drives a 50-volt motor for running various agricultural machines, such as a chaff-cutter, a circular saw, and a root-pulping machine. The chaff-cutting required for the homestead is easily dealt with by this machine, a ton of chaff being cut in two hours and also a considerable amount of firewood, etc., is sawed. The motor is belted direct to the various machines and only runs one at a time. The plant is entirely automatic, being fitted with a patent tail gear, which gives very accurate adjustment to the wind. This arrangement consists of three tails. Two of these are connected together, so that when the wheel is required to stop they have only to be pulled down into a horizontal position, and the wheel immediately comes up into the wind and stops running. In the same way the tails are so balanced that when the wind reaches a predetermined velocity, the tails tend to take the horizontal position, and so bring the wheel more or less out of the wind as the strength of the wind varies. In recent gales which swept over Bromyard, where the plant is in operation, a very good test was given of its stability, and though a very large tree was blown down close to it, the wind turbine suffered not the slightest harm.

In practice, it is found that the power from the wind turbine is so reliable that it is almost the same as a supply from the public service.

As the wind turbine is placed on ground somewhat higher than the dwelling house on the estate where it is used, there is often a good wind blowing at the turbine when none is felt down at the house. The plant is guaranteed to produce 3,000 units a year, but in practice it produces at a much faster rate than this. In 12 hours during a test, it produced 14 units, with wind averaging 15 miles an hour. The average wind in this situation would probably be, however, about nine miles an hour, and the output of the plant in a year is probably about 5,000 units, more than sufficient for all normal needs.

THE FLOWER WITHIN THE CRYSTAL.
A funnel is necessary to produce this result.

A SERIES OF BUBBLES BLOWN ONE WITHIN THE OTHER.
The trick is done through the instrumentality of a straw, with which the bubbles are skilfully pierced each time the next one is to be blown within.

SMALL STATUE UPON WHICH A BUBBLE HAS BEEN BLOWN.

THE SCIENCE OF THE SOAP BUBBLE

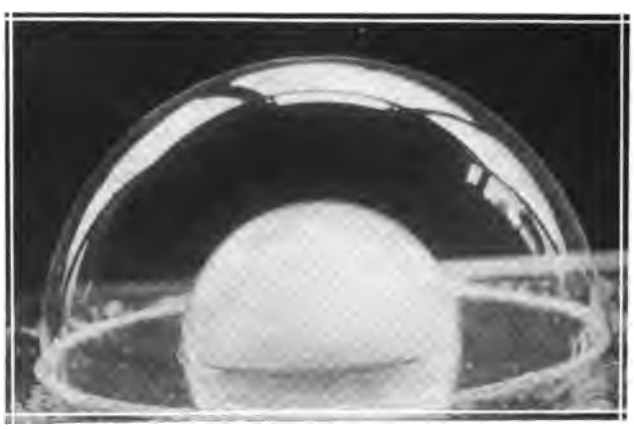
By

HENRY SHELDON

BEFORE the Imperial City of Rome was founded in the year 753 B. C., the children in the neighboring state of Tuscany were blowing soap bubbles. In the museum of the Louvre, Paris, there is a vase over 2,500 years old which shows a group of Etruscan youngsters engaged in this pleasing pastime.

All the genius of the great mathematician and physicist, Sir Isaac Newton, was directed, over two hundred years ago, to the solution of the problem, why soap bubbles display the colors they do.

Thus this slight, diaphanous, scarcely tangible airy creation of soap and water solution and the human breath has been an object of amusement for thousands of years, a subject for scientific inquiry for centuries. It is therefore, something far more than a toy. The halo of antiquity, the scientific truth of modern times may, figuratively, be said to be blown into its delicate structure.



THE "POACHED EGG" TRICK.
No lady can perform this trick—except in the privacy of her apartments—as it requires the smoking of tobacco. A hemisphere is first blown upon the glass surface. The performer then takes a puff at pipe or cigarette, and, redipping the straw, puffs the smoke into the dome. An inner bubble is thus formed, which is white, due to the coloring by the smoke.

There are tricks almost innumerable that may be performed with soap bubbles. At the same time these tricks may be utilized to illustrate some of the fundamental laws of the actions of liquids and gases.

Why and what, one may with perfect propriety ask, is a soap bubble? All of us know, of course, that it is composed of soap and water, forming a very thin shell, sphere-shaped, which encases a quantity of imprisoned air. But beyond that, it would be perfectly safe to wager, the average man knows very little about soap bubbles—certainly but little concerning the laws governing their formation.

In explaining the phenomenon of the soap bubble, it should be stated, in the first place, that the surfaces of all liquids are in a state of tension, that is, they are stretched or drawn. They are in the same tense condition as a piece of india rubber stretched between the fingers.

APPARATUS NEEDED FOR BUBBLE-BLOWING.

With a bottle of soapy water, a clay pipe, a straw, a wire ring and a funnel, wonders may be performed. Each instrument should be dipped in the soapy solution each time before using.

THE CHAIN OF BUBBLES.

Each individual bubble forms a link in the chain. This is done by throwing the first bubble that emerges from the pipe into the air, quickly blowing a second, and then catching the first upon this, and so on until some hitch in the proceedings or the rapidly increasing number of links causes the bubble to burst.

Suppose, now, a pipe or hollow tube is dipped into a bowl of soapy water and air blown through from the mouth into the solution. This air takes a spherical form, and being lighter than the liquid

How the Funnel Is Used to Enclose an Object in a Diaphanous Shell.

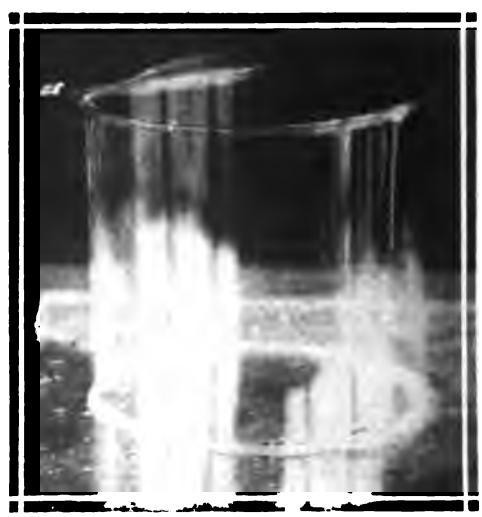
which encases it on all sides begins to rise toward the surface. The liquid offers resistance to this progress, and so the air bubble is flattened on its upper side, that is, in the direction in which it is moving. To continue to rise it must displace the water in its way. The liquid has to flow aside. As the sphere of air approaches the surface it moves more and more rapidly. Owing to this acceleration the water has, correspondingly, to increase its rate of motion, till, finally, it is unable to get out of the way of the ambitious air bubble. Hence, when this air bubble is very near the surface, it carries the thin tension surface—or film of liquid—up with it in the form of a soap bubble.

Now, as to why soap is necessary to produce this effect. In the formation of a bubble, theoretically, air, blown into water should accomplish this result. And, as a matter of fact, small bubbles are formed in this manner. The flecks of foam that often appear on the surface of a running stream are merely tiny air bubbles. The philosophy for using soap in the blowing of bubbles is, that this substance gives a viscosity to the surface of the liquid not to be secured otherwise. Where plain water is used, the tiny particles of the liquid tend to run down as rapidly as the sphere takes form. The surface of the bubble therefore is too thin, and the interior air instantly bursts through. On the other hand, a bubble may collapse because of its too viscous surface. In this event, the particles drop down in masses, tearing holes through and, likewise, causing an immediate collapse of the structure.

The why and wherefore of bubbles being thus explained, the several tricks herewith outlined, will be the better understood.

A good clear soap of medium grade, such as is used for ordinary washing purposes will be found best suited for the solution. After thoroughly rubbing this in the water till rich suds have formed, take a spoon or ladle and carefully remove every particle of foam and lather from the surface by skimming.

For the performance of the tricks a pipe, a straw, a funnel, and a wire ring



The Barrel or Cylindrical Shape.

This is formed by tossing a bubble from the end of the pipe into the air, catching it dexterously and gently with two rings of wire, and stretching it.

TWO BUBBLES, OR A DOUBLE BUBBLE, UPON THE WIRE RING—A FEAT AT ONCE CLEVER AND INGENIOUS.

PAPER FLOWER WITHIN A BUBBLE.
If a straw is gently inserted the petals may be made to open and close by blowing in or sucking out air.

are the essentials. Other apparatus such as the skill of the bubble blower may require, or his ingenuity suggest, may be added to these for the performance of additional tricks. The more numerous, the greater their variety, of course the more pleasing is the performance to the spectators.

Properly equipped with apparatus, and thoroughly practiced on the execution of his various tricks or feats, whichever one may choose to call them, the performer may give much entertainment to his friends for even a whole evening. Especially will bubble blowing be found a very excellent means of entertaining children, who, apparently never grow weary of watching the iridescent shapes take on changing hues and forms.

TO THE SMALL BOY, BUBBLE-BLOWING IS AN AESTHETIC PLEASURE AND AN ART.

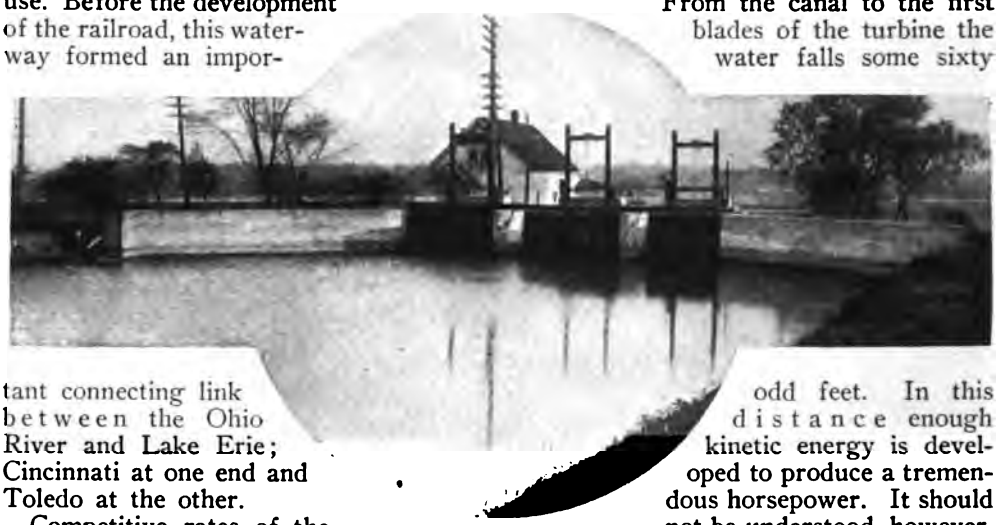
It will be found, however, that children, active, eager and imaginative as they are, will not be content to sit idly by and watch some other person perform these marvels with the soapy bubbles, wonderful and fascinating as they are. Every child—at least every average child, with the usual instincts and tendencies that go with immature years, will seek, even demand, to have a share in the pleasures of this subtle art. For, indeed, to the small boy — and to the small girl of course, also,—bubble-blowing is an aesthetic pleasure and an art. The almost intangible nature of the vari-colored, diaphanous structure —its light buoyant build — makes an appeal almost as seductive as a great fleecy cloud navigating the blue heavens on a fine summer's day.

ELECTRIC POWER FROM A DISUSED CANAL

By

GEORGE F. WORTS

SEVERAL years ago, a serious problem confronted the canal commissioners of the state of Ohio. The Miami and Erie Canal, upon which several millions of dollars had been expended, was falling into a rapid state of disuse. Before the development of the railroad, this waterway formed an important connecting link between the Ohio River and Lake Erie; Cincinnati at one end and Toledo at the other.



DISUSED CANAL THAT IS LIVING A SECOND LIFE.
The old Miami and Erie Canal now generates electric power.

Competitive rates of the steam roads were said to be responsible for driving the canal barge out of business in this case, with the result that the costly canal was left a burden to the state with no apparent means of even partially repaying the original investment.

The state engineers, in looking the matter over, noted that at several points along the lower route of the canal, it is sufficiently high above an adjacent river to furnish the supply for hydro-power purposes in paper mills, flour mills, etc.

Probably the most advantageous site for a project of this kind was selected and is now occupied by a hydro-electric power company at a point about ten miles above Toledo, where the canal and river approach within several hundred feet of each other. At this point, the difference in level of the two streams is about sixty feet; ample for the successful operation of a low pressure turbine, providing the supply is continuous.

From the canal to the first blades of the turbine the water falls some sixty odd feet. In this distance enough kinetic energy is developed to produce a tremendous horsepower. It should not be understood, however, that this energy can be compared with the enormous power developed in such plants as are in operation at Niagara and Victoria Falls where the water drops several hundred feet.

The company operating this station is erecting another plant farther up the river in which the drop will amount to barely fifteen feet. Of course there is a large supply of water available to make up for the lack of pressure. The low head as a hydro-electric source, is rather an experiment, although quite successful in its application as has also been demonstrated in Michigan, Indiana and elsewhere.

HOW THE THRIFTY SCOTCH USE THEIR SCHOOLROOMS

By

CHARLES PHELPS CUSHING

IN a building so huge as the five-story and basement plant of the Glasgow Technical College, the five hundred young Scotch specialists who attend in the daytime seem more like fifty. One or two or three in a room, dour, many be-spectacled, and a few in dressing gowns, they work among textbooks and test tubes and assay furnaces like joy-forsaking monks.

But at night the visitor sees a picture in sharp contrast: the enrollment jumps from five hundred to more than five thousand; along with the night-course collegians march in two regiments of student workingmen; and the whole building blazes with yellow light.

For ten shillings ($2.50) a term a Glasgow man may learn in these night trade classes the first principles of the plumber's or the printer's trade; for seven and sixpence ($1.87), boiler making or sheet metal work; for five shillings ($1.25), how to cut cobbler's patterns or a course for shoe-store salesmen.

There are rooms full of looms and fabrics and dyes, if he cares to learn the principles and practice of textile manufacture and there are other laboratories for bakers, watch makers, tailors, furniture designers or sailors. Three in every four of his classmates will be older than twenty, so he need feel no shame at going to school again. Hundreds of the men he passes in the halls will have only a common school education.

That public school buildings should be used only a few hours in the daytime implies an inadequate return on the taxpayers' investment. In Glasgow, Scotch practicality has seen this and applied a remedy. Result: the efficiency of an educational plant was multiplied by ten.

It is characteristic of the Scotch to solve a problem by common sense, whenever such problem arises. Are their schoolrooms empty at night? Then they must be filled! The invitation is given and the thing is done.

FIVE THOUSAND YOUNG SCOTCHMEN ATTEND THIS SCHOOL AT NIGHT. The Glasgow Technical College.

NEW ANTI-WRECK SIGNAL

By

P. R. KELLAR

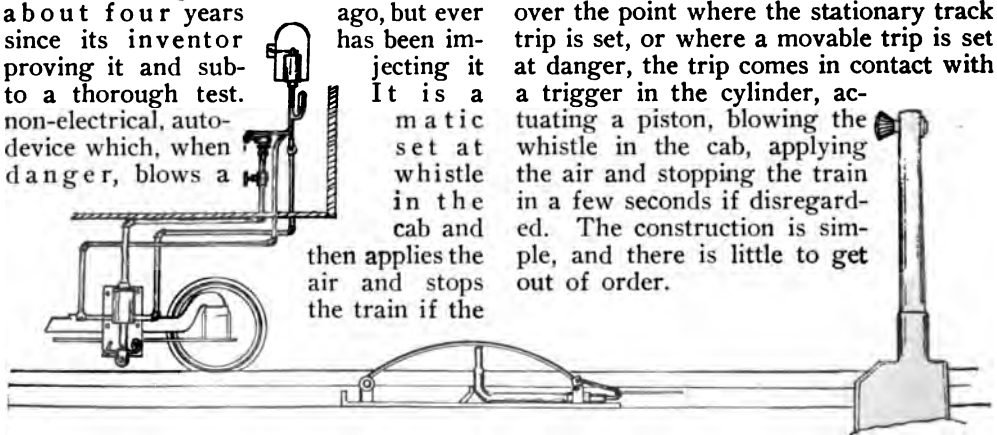
IN spite of all modern improvements and safety devices, the operation of railroads still continues to exact an enormous toll of killed and injured in the United States. In 1907, the last year for which figures are complete, the killed numbered 11,838 and the injured 111,016. The railroads fought when the Federal government, through the Interstate Commerce Commission, insisted upon their adopting certain safety appliances.

Now they are glad of it and are continually on the watch for something that will eliminate more of the danger of railroad travel and employment. The American Railway Association and the Interstate Commerce Commission are contemplating an early review of the safety appliances with a view to uniformity, etc. Their attention will be called to a new device, the invention of an old railroad locomotive engineer living in Danville, Ill. It is said to be one of the simplest yet most effective safety appliances evolved since the air brake was invented.

The new signal device was patented about four years ago, but ever since its inventor has been improving it and subjecting it to a thorough test. It is a non-electrical, automatic set at danger, blows a whistle in the cab and then applies the air and stops the train if the engineer and fireman disregard the signal.

All old engineers realize that many bad wrecks are caused by engineers sleeping at their post—that engineers when they have been in the harness for several years, sometimes are unable to keep awake. The new signal is made in three styles, stationary, portable and movable. The stationary signal is designed to be fixed permanently at all danger points, and to be always at danger, giving the warning whistle and stopping the train if disregarded. The movable signal is to be operated in connection with switches, block signals, semaphores, etc. The portable signal weighs about ten pounds and can be carried from place to place by flagmen and located at places temporarily dangerous, instead of flags or lanterns, or in addition to them.

The invention consists of two parts. One is a trip affixed to the outer ends of the ties, where it will be clear of all obstructions. The other is a cylinder attached to the front truck of the tender, and operated by air connected with the train air system. When the train passes over the point where the stationary track trip is set, or where a movable trip is set at danger, the trip comes in contact with a trigger in the cylinder, actuating a piston, blowing the whistle in the cab, applying the air and stopping the train in a few seconds if disregarded. The construction is simple, and there is little to get out of order.



NON-ELECTRIC AUTOMATIC SIGNAL.

It blows a warning whistle in the cab and if the signal is disregarded stops the train by applying the air brakes.

PEANUT OIL TO DISPLACE LARD?

By

COULEY H. PURDOM

AN oil for all sorts of cooking that is better than lard and superior to cotton-seed oil is now being commonly produced from peanuts, which are only beginning to be appreciated in this country. The lowly peanut may come into the lead among principal food stuffs and useful plants, and the oil that is produced from it may become one of the leading products of portions of the South.

Peanut oil is only less valuable commercially than olive oil. Deodorized it has long been used as an adulterant and in some places has been sold without detection under the name of the olive product. It is a non-drying oil used heretofore, widely as a lubricant and better than sperm oil as an illuminant, except in cold weather when it thickens. It is made by heating, grinding and pressing the kernels of the nuts. The mills which have been making the cottonseed oil can make the peanut oil with very little change in machinery, and are, therefore, in a position to profit highly by the wider use and growing of the peanut.

Virginia has been the principal peanut growing state, though other Atlantic states and Tennessee have been prominent in the industry lately. Now the nut is grown in many warm climates, and is a staple crop, despite its restricted use, so far. As a human diet, as a stock food, as a soil enricher and as a source of oil, the peanut and its vine are tremendously useful. In France the market has long been excellent and Marseilles has had almost a monopoly of it. The demand has never yet been satisfied and with the new uses to which the oil is now being put there will be a greatly increased buying public.

Experiments carried on in Louisiana recently showed that the oil made from the American nut is sweet and clear and will never turn rancid if properly kept. It serves as an ideal shortening and cooking oil and it is expected that there will be a huge demand for it in American houses as soon as its merits are realized.

CULTIVATING THE SPANISH PEANUT IN THE FIELDS OF LOUISIANA.

Not only can the nuts be sold at a cheap price, say forty cents a bushel, and net the farmer a revenue per acre equal to cotton, but two crops can be raised off the same land each year. This can be done by planting potatoes first and following them

GATHERING THE HARVEST.
The vines are cut and stacked around poles.

POLE, WITH VINES ABOUT IT, READY FOR THE STACK.

with peanuts, or by planting the peanuts first and following with fall oats.

Not only are the Spanish and Brazilian nuts valuable as oil producers, however; from them the manufacturer also obtains valuable by-products. There is a good market for the cake after the oil is pressed out. Its value is greater than cotton-seed cake and there is a wide market in Europe for it. The vine makes an excellent hay, and the tables of the agricultural department show it to be one of the most valuable of the stock foods grown in this country.

Twenty years ago the cotton-seed oil industry was in its infancy. Today cotton-seed and its products furnish a considerable portion of the value of the staple itself. Twenty years ago the farmer saved what seeds were necessary to plant the next year and threw the rest into his fields as fertilizer. The peanut can be raised on poor, sandy soil, and many think that in a few years the cut-over pine lands will be covered with great fields of Spanish and Brazilian nuts, from which will be made the cooking oils of the nation.

It is already proved that the nuts can be grown all over the South, and another bulletin issued by the department of agriculture, says:

THE CUT VINES AS THEY APPEAR STACKED.

AREA ADAPTED TO THE PRODUCTION OF PEANUTS.
From map prepared by the United States Department of Agriculture.

"The demand for peanuts as a human food is constantly increasing. There are thousands of acres of waste lands in the Southern states that would produce enough peanuts to keep the oil mills running and furnish more than enough oil for home consumption."

"The peanut vines, after the removal of all the first-class peas, have a feeding value practically equal to the cost of the field culture of the crop. An acre of first-class peanuts, calculating the yield at a ton of vines, worth from eight to ten dollars, and sixty bushels of peas worth from forty to sixty dollars, will give an income of from forty-eight to seventy dollars. The cost of growing an acre of peanuts is variously estimated at from twelve to twenty-five dollars, including seed and fertilizers. These

IMPROVED METHOD OF PICKING THE PEANUTS.

figures show a net return of from thirty-six to forty-five dollars, which is above the average of the crop, as now grown in the United States, but decidedly lower than may be expected under favorable conditions and proper cultural methods."

¶ If we are not stupid or insincere when we say that the good or ill of man lies within his own will, and that all else beside is nothing to us, why are we still troubled?

¶ No great thing is created suddenly any more than a bunch of grapes or a fig. If you tell me that you desire a fig, I answer you that there must be time. Let it first blossom, then bear fruit, then ripen.

—*Epictetus.*

WIRELESS TELEPHONE FOR EVERYBODY

By

WILLIAM T. PROSSER

A WIRELESS telephone outfit in a suit-case—or in any other convenient carrying receptacle—complete, and requiring only connection at any ordinary electric-light socket to make it capable of operating over a distance of fifty miles, is the latest product of invention in this wonderful field.

To William Dubilier, a California youth of twenty-two years, belongs credit for perfecting an instrument to such a degree of nicety that it is of readily portable bulk and yet of high efficiency. With a range of something like three hundred keys and escaping many of the problems of interference, such an instrument can accomplish wonders for the individual user. Wherever sufficient current is available for lights, there the little wireless set may be put readily to work for communication over areas of trackless forest, desert or sea. That it will be the means of saving lives, when nothing else will avail is at once apparent. That it will be invaluable in new country, ahead of the wires or the regular wireless installations, in military activities, and in all times and places where ordinary means of message-sending are interrupted or unestablished is easily recognizable.

Young Dubilier, inventor and electrical engineer, has made a

WILLIAM DUBILIER TALKING FROM SEATTLE TO TACOMA, A DISTANCE OF THIRTY-FIVE MILES, OVER HIS WIRELESS TELEPHONE.

specialty of the wireless telephone and his success in this specialty has attracted wide attention. Most of his experiments have been carried on in Seattle. He is a product of Cooper Institute, New York, where he studied while supporting himself by hard work. So he deserves, every bit, the harvest he is reaping now. His achievement is the result of scientific method and close application through a long period of experimentation and, despite his youth he has won a veritable triumph.

THE SIMPLIFIED TRANSMITTER AND OSCILLATOR OF THE DUBILIER WIRELESS TELEPHONE SYSTEM.

The Dubilier instruments are not noticeably different in principle from the wireless telephone devices of the past, but they are compact. Instead of great coils of wire and oscillators as big as a dining-room table, the Dubilier apparatus is reduced to marvelously small dimensions, while any commercial lighting circuit gives all the power that is necessary.

Mr. Dubilier is not particularly keen in exploiting his invention, his explanation being as compact as his instruments. He merely says that the electric light current passing through the new type of oscillator is rendered into electrical waves to the number of 100,000 a second, and that these affect instruments attuned to the same key within a wide radius. Simple, isn't it?

"Influential men believe in my invention as much as I do, and we plan to build a factory and manufacture my machines upon a large scale," said Mr. Dubilier in Seattle recently. "This will be, I believe, the first wireless telephone factory ever opened in America—or the world, for that matter. The machines are not costly to turn out, and we will be able to supply them so cheaply in large lots that they may be used extensively in cities, much more cheaply in rural communities than the present wire systems, for marine and coastwise work, and for special uses such as by forest rangers on the great reservations of the Rocky Mountains and Pacific Coast.

"The machines will be of particular advantage in sparsely settled districts, as in the gold-camps of Alaska. Prospectors within a radius of thirty or forty miles of civilization, for instance, will be enabled by the use of one of these light sets to keep in continual touch with what is going on, and undoubtedly many lives will be saved by the practical application of the device."

Wireless, and especially the wireless telephone, has been what might almost be called an obsession with young Dubilier ever since he was old enough to know anything about the subject at all. Born in New York in 1888 he received his early education in the public schools. His parents were not able to keep him in school through the high school course, and he left high school to secure employment. He saved his money, and later, by doing odd jobs through the course, gave himself the benefit of three years study of electrical engineering.

It was in 1904 that he began his own experimenting with the wireless telephone, and after many disappointments and discouragements he perfected one of the first pieces of apparatus of that kind. Graduating from his technical course at the age of eighteen he became an inspector for the Western Electric Com-

pany in New York. But wireless continued to fascinate him, and he determined to take a course in the Cooper Institute. The hours of the institute were from 9:30 until 3:30. Hurrying each day from the lecture-room to a telegraph office he delivered messages from 4 o'clock in the afternoon until midnight.

THE RECEIVER OF THE WIRELESS TELEPHONE.

After his course was over he became chief electrician of a wireless concern, and then technical director of another. All the time he was experimenting with his own telephone, and he invented a number of minor wireless instruments. He is the author of the "Wireless Telephony" chapter in Prof. H. L. Twining's book on wireless, one of the few works of the kind in existence. His lectures on wireless attracted favorable comment. With some of the best known experts in the country his technical testimony has been sought by the law courts.

It was just a few months ago that he completed the telephone apparatus that is his great work so far. Sensitive and delicate, it yet seems to be practical in every respect. A cabinet ten inches each way, and six inches deep will hold the mechanism.

Most of the experiments with the new device have been carried on at Seattle and between Seattle and Tacoma, a distance of thirty-five miles. Conversation carries that far as clearly as on the ordinary telephone. As some of the ships of the United States navy are equipped with wireless telephones Mr. Dubilier had an excellent opportunity to compare the merits of his invention with that used by the navy department, as the Puget Sound navy yard is located about sixteen miles from Seattle. J. B. Annis, first class electrician, United States signal corps, sent this message to the inventor after one of the tests:

"A good deal plainer than the telephone we use here."

Which would seem to augur well for the invention.

Mr. Dubilier believes he can still further perfect his receiving and transmitting devices with their control system so that much more than three hundred telephones—representing that many different attunements—can be used at the same time without interfering with each other. However, even that number is a long step forward. If Mr. Dubilier does nothing more for wireless telephony, the aerial talk-transmitting systems of the future will owe him a notable debt of gratitude. And he is only twenty-two.

SLATE IS USUALLY PICKED FROM THE BLASTED DEBRIS.

GAMBLING IN SLATE AND LIVES

By

RAYMOND A. FOWLES

THE switchboards that handle the powerful electric currents of the New York subway are made of slate and came from quarries in Maine. They came from there because experience has demonstrated that those quarries produce the purest and finest slate in the world. London wanted some switchboards for her underground railroad system—wanted the best that money could buy. It was decided that they must be made of pure slate. The order did not go to any of the large quarries of England or Wales. It crossed the Atlantic and finally landed at the office of the superintendent of those Maine quarries. Not only electricians, but nearly all first-class architects as well, where work perfect in quality and beauty of blue-black shades is desired, always indicate their preference for Maine slate. Public buildings from the Boston postoffice to those being newly erected at San Francisco bear witness to this fact.

In the downward sweep of a great valley densely wooded, surrounded by rugged hills and beautiful lakes, are located these quarries which are sending out their products to all parts of the world. Long, yawning pits in the ground, flanked by high walls of stone and ragged dumps, make scars in the beautiful landscape, but you forgive them in remembering how they have served in the world's work. The

A HOPELESS CASE.
The deposits are here too treacherous to be worked.

slate appears in veins running northeast and southwest and can be traced several miles. The greater part, however, lies under such a depth of earth or water as to make its uncovering prohibitive on account of the cost. The line of quarries which have been worked is about a mile long and is now under the control of a single company. The natural disasters incident to such quarry work have kept the fortunes of this company in a state of unstable equilibrium.

THE WORKMEN AT THE STEAM DRILLS.

The task of getting out the slate is difficult, dangerous, and expensive. The slate veins stand parallel to each other but separated by veins of quartzite rock, the whole mass canting toward the northwest one foot to every ten in depth. The refuse has to be taken out as well as the valuable slate. Ninety-five pounds out of every hundred hoisted to the surface go to the dumps. This item of expense, however, is a mere bagatelle when compared with that occasioned by the slides which in one minute destroy the work and hopes of years.

If, when Nature tipped up these deposits of slate sediment—mostly silicate of aluminum—she had stood them perpendicular instead of slanting them northward tremendous difficulties would have been obviated. Their present position causes an ever increasing overhang of the southern wall as the quarry is sunk farther down, and this can only be prevented by taking off enough rock as the work progresses to keep the wall perpendicular. No one except a quarryman can comprehend what an enormous task this would be. The great expense has thus far prevented its

OFTEN BECAUSE OF THE SLANT OF THE DEPOSIT, QUARRIES HAVE TO BE ABANDONED.
Such a quarry, filling with water, is shown in the front right foreground.

LOOKING DOWN A LINE OF SLATE QUARRIES IN MAINE.

being done. Sooner or later, however, this will probably be brought about.

These immense overhangs sooner or later fall into the pit. The fear of such slides are the spectres that haunt the minds of workmen and operators alike. Death lurks here at all times and usually comes instantly from explosion, falling rocks, the slip of a careless foot, or a life line ill adjusted; but the most terrible is the deep groaning that precedes the avalanche of stone and earth as it trembles upon the brink, and then goes tearing, crashing, roaring into the pit below.

The work of men looks puny and small beside that of frost and gravitation. Several years ago a slide went into the pit of one quarry which had been sunk to a depth of three hundred feet. On account of the great quantity and perfect quality of the slate thus buried, it was decided to remove the debris. It took five derricks two years and six months to do the work. Everyone was rejoiced when the task was done. It was hoped that slate to the value of half a million could be taken out before the next slide should come. Pipes, pumps, drills, and tools were put in place. Preparations were scarcely finished when the south wall began to groan with the agony of suppressed power. After a few hours of travail, the great mass of stone leaped into its newly made grave, burying slate and machinery beyond hope of recovery in this generation, at least. Some time the treasure will again be laid bare.

Other quarries have this same fatal slant of the slate veins and like disasters have well nigh ruined the business in places. Curiously enough, the dips of two Maine parallel quarries are opposite. The position of the slate beds in Vermont and Pennsylvania is more fortunate. Appearing largely in the form of folds, the slate is spread over considerable surface but comes to an end two or three hundred feet under ground. Some have their dips so little inclined from the horizontal that they may be worked as surface quarries by means of the terrace system. The Maine quarries are long and deep but have little width. The great slate beds of Wales are found in mountains. They are worked by the terrace system, but entirely under ground; the quarries being reached from the surface by means of tunnels. Each bench has its crew and fifty feet intervenes between each crew to make accidents less possible. Pillars of rock are left to prevent the "roof" from falling in. Welshmen are born to work in slate as a fish is born to swim in water, and great numbers of them work in American quarries.

WOMAN VERSUS A MORTGAGE

By

JOHN E. TAYLOR

THE GIRL WHO PAID OFF A FARM MORTGAGE.

THERE is a girl in Somerset County, Maine, in the northern part of the state who has done a man's job, more than a woman's job, and now has the satisfaction of feeling that she has reached a certain stage in success.

When she was nine years of age the parents of Miss Eva Storer gave her two old hens to have for her own. The next year she set them and got a fine lot of chicks. They were of mixed breed but she raised them. She had taken some of her eggs from the hens, sold them, and with the money bought a sheep. When a lamb was born she exchanged it for a calf and raised the calf to a cow. She then sold eggs from her pullets and bought more sheep. She then had four. Her mother gave her a pair of bronze turkeys, when she was twelve years old. By this time she had considerable stock of her own on the farm.

During this time she had been attending school and the year she was thirteen she raised fifty young turkeys. They were hatched in May; in October she sold them for a dollar apiece. That year she raised a lot of chicks and some of these she sold for a total of twenty dollars.

THE HEN HOUSE THAT GAVE MISS EVA STORER HER START.

Miss Storer attended school until she was sixteen, when her father was taken sick, her mother was partially crippled and the burden of caring for the rest of the family, consisting of one small sister besides her parents, fell on her. The family moved to Norridgewock. They bought a farm that had a poor house on it and paid only two hundred dollars down and then carried a mortgage of eight hundred dollars. That was six years ago.

When they came to Norridgewock she had saved one hundred dollars from her poultry and sheep to pay in towards this farm. Her mother paid in one hundred dollars more and the rest was to be paid in in annual installments of one hundred dollars, with interest. When the year was up she was able to meet the payment of her own accord, her parents having still farther declined and were not able to assist her on the farm. The next year Miss Storer began to work in the garden, raising peas, potatoes and sweet corn, and she kept this system up for the six years and the farm paid for.

From thirty of her pullets she made $130 in a year's time in this way:

50 dozen of eggs for hatching @ 50c a dozen	$25.00
Broilers raised from other eggs of the pullets at from 60 to 70c apiece	70.00
Incubator chickens sold at hatching @ 10c	10.00
For the 30 pullets at the close of the year	25.00
Total	$130.00

Inherited

CATTERSON—"Notice how Carstair's wife makes up of late? Should think he would stop her."

HATTERSON—"Has tried to; feels badly about it. But he says it's no use; she learned it from their daughter."—*Life.*

The Parrot That Quit Talking

KERRIGAN went on a trip to South America, and while there bought a present for O'Brien in the shape of a pretty Spanish parrot, which was shipped to O'Brien. When he got back home he said to O'Brien:

"Dinny, did ye get the foine parrot Oi sent ye?"

"Oi did that, Kerrigan, and Oi wants to tell ye that Oi never put me teeth into a tougher bird in me life!"—*New York American.*

That Critical Moment

THE PLAYWRIGHT—"Ah! The audience is calling for the author."

THE HOUSE MANAGER—"I hear 'em; but you can get out through the alley and I'll hold 'em back while you beat it."—*Philadelphia Evening Bulletin.*

Tommy's Status

"FIFTH grade this year, Tommy?"

"Yes, sir."

"You're in decimals or fractions now, no doubt?"

"No, sir. I'm in crochet work and clay modeling now."—*Louisville Courier-Journal.*

These Modern Nuisances

A FORMER resident of Marshall, Mo., was asking about the old town.

"I understand they have a curfew law out there now," he said.

"No," his informant answered, "they did have one, but they've abandoned it."

"What was the matter?"

"Well, the bell rang at 9 o'clock, and almost everybody complained that it woke them up."—*St. Louis Post-Dispatch.*

Precise

TOM MOORE was once at a dinner, and opposite him sat a Mr. Reach, whose name Moore had seen in print, but had never heard pronounced. The poet addressed him politely as Mr. Reach, and he swelled up indignantly and said:

"My name is Re-ack, sir."

"Indeed!" replied Moore; "well, Mr. Reack, will you kindly pass me a pe-ack?"—*Emporia Gazette.*

Easily Mended

OF the diplomatic circles is a delightful woman whose English is still French. She was urging an officer of the navy to attend a ball, the invitation to which he had already declined.

"I can't," he protested; "I have burned my bridges behind me."

"Oh," she replied, "I will lend you some of Henri's."—*San Francisco Argonaut.*

Reckless Eph

UNCLE EZRA—"Do you think the money young Eph Hoskins made down in New York will last him long?"

UNCLE EBEN—"You bet it won't! He's going at an awful pace. I was down in the general store last night, and young Eph was writing hundred-dollar checks and lighting his cigars with them."—*Puck.*

A Lightning Change

A CHICAGO banker was dictating a letter to his stenographer. "Tell Mr. Soandso," he ordered, "that I will meet him in Schenectady."

"How do you spell Schenectady?" asked the Stenographer.

"S-c, S-c—er—er—er—— Tell him I'll meet him in Albany."—*Argonaut.*

Too True

"THINGS might be worse," said the man who tries to be cheerful.

"I thoroughly agree with you," replied Mr. Growcher. "And what's more, I think they are going to be."—*Washington Star.*

Pragmatism

THIS was the note which was handed to one of the grade teachers the other day:

"Dear Mum—Please ixcuse Johnny today. He will not be at school. He is acting as timekeeper for his father. Last night you gave him this iximple, if a field is 4 miles square how long will it take a man walking 3 miles an hour to walk 2½ times around it? Johnny ain't no man, so we had to send his daddy. They left early this morning, and my husband said they ought to be back late tonight, though it would be hard going. Dear Mum, please make the nixt problem about ladies, as my husband can't afford to lose the day's work. I don't have no time to loaf, but I can spare a day off occasionally better than my husband can. Resp'y yrs. Mrs. Jones."
—*Miami News.*

Why, the Idea!

MAN (at the phone; to man at the other end of the wire)—"How dare you talk to me like that! You're not my wife!"—*Satire.*

Reform Too Pronounced

IT was on a street-car the other morning that a passenger, whose general get-up suggested a clerical calling, was overheard saying to a companion:

"I realize that women are by nature and instinct bound to go in for adornment in the matter of dress, but they are getting more and more recklessly extravagant. I believe in temperance in dress."

"Temperance is all right," was the reply. "I believe in temperance myself, but what with the hobble skirts and cobweb stockings it looks more to me as though the women were going in for total abstinence."

Naturally

FAT ACTRESS—"I do feel pleased. My new rôle fits me like a glove."

FRIEND—"Of course, it's the biggest in the piece."—*Pele Mele.*

Americans Beware

UNSCRUPULOUS PICTURE-DEALER — "S-h-h. This is the left eye of Leonardo's 'Mona Lisa.' You can have it for $500."—*Punch.*

Law-Abiding

"WHAT are they moving the church for?"

"Well, stranger, I'm mayor of these diggin's, an' I'm fer law enforcement. We've got an ordinance what says no saloon shall be nearer than 300 feet from a church. I give 'em three days to move the church."—*Fun.*

POPULAR · SCIENCE & MECHANICS SUPPLEMENT ·

TO RESTORE LIFE

THIS apparatus reduces the work for artificial respiration considerably and has been tried at the physiological department of the "Karolinska Institutet" in Stockholm by Prof. Dr. J. E. Johansson, also by the directors of the Association of Swedish physicians, and also by the life-saving bureau.

The apparatus can be managed by anyone and adjusted to different sizes. It is said to give better results as to the ventilation of the lungs than any other method, it is easily transportable and ready for use at all times when it is desired to put it into service.

It is to be kept at places where there is danger of life, as on boats, in mines, places where high-tension electric currents are utilized, and of course at hospitals, life-saving stations and bathing resorts, at which latter places drowning accidents are very frequent.

The work of respiration is begun by bringing the levers as far backwards as possible (inspiration) and then upwards and a little forwards and downwards to-

THIS RESTORER OF LIFE CAN BE OPERATED BY ANY ONE.
It is a Swedish invention.

BLANCHE SCOTT, THE INTREPID GIRL AVIATOR, WHO ATTRACTED CONSIDERABLE ATTENTION RECENTLY BY HER AEROPLANE FLIGHTS AT EMERYVILLE, CALIFORNIA.

wards the patient's breast (expiration). The ropes are taut when the lever is standing at right angles to the board. A further forceful drawing forwards, downwards towards the breast presses it together in order to produce a powerful expiration. The movements are executed in time with the operator's own breathing or regularly about sixteen times a minute.

The invention is one that, in all likelihood, will bring many a person back who would otherwise pass to his grave. Life, especially human life, is being held today at a high valuation, as is attested to by the efforts of scientists to prolong it.

MAN WITH LONGEST BEARD

AT the age of fifty years Mr. S. G. Brinkley, of North Carolina, finds himself with the longest beard of any man in the world. The chin adornment drops to the length of five feet four inches, which to most men would appear too much of a good thing, when it comes to earning a

HIS BEARD IS HIS FORTUNE.

'WHAT'S COMING 'ROUND THE CORNER?"

HOW STREET CAR TRAFFIC IS DIRECTED IN LOS ANGELES.

By means of towers at street crossings a semaphore system is operated. The man in the tower sets the signal to guide the approaching motorman.

living. Not so as regards Mr. Brinkley, however, for in his case the extraordinary "lace curtain" adornment has been made useful as well as ornamental, as he earns a good salary by exhibiting in connection with one of the country's leading circuses during the summer season.

"WHAT'S COMING 'ROUND THE CORNER?"

TO see 'round a corner is usually reckoned as one of those things which come under the category of physical impossibilities, and more street accidents are due to the limitation of our vision in this respect than from any other cause. The simple device shown in our photograph, however, has been adopted in the town of Teignmouth, the popular Devon winter resort in England, to prevent street-corner accidents.

Like the majority of towns in Devonshire, Teignmouth has many hills, and at one spot, that where the road from Dawlish—a steep decline and very narrow—enters the town, a large mirror has been set upon a post in such a position that motorists and others coming into the town can see round the corner, and thus avoid accidents. This is one of those "good ideas" which might well be emulated on a large scale, for the mirror is in no wise unsightly, and is indeed serving a most useful purpose.

SUNFLOWERS FROM RUSSIA

THESE are not ordinary sunflowers. They are a superior and cultivated variety, fetched from Russia by our Department of Agriculture.

In that part of the world sunflowers are grown on a vast scale for their seeds, which are utilized in the manufacture of oil for table and other purposes. Also the seeds are roasted and eaten in Russia much as we eat peanuts.

A kind of bread is made from sunflower meal. Indeed, it is a valuable plant, and, now that these new and improved varieties have been secured, it may be that our farmers will take to growing sunflowers extensively.

HUGE DOME COSTS LIVES.

Wisconsin's new $6,000,000 state house is rapidly progressing, although it is estimated that fully five years more will be necessary to finish the structure. The illustration shows the perilous nature of the work on the dome, the steel structure of which has all been erected. One man was killed by falling from the apex, while two other men lost their lives in the building of the two wings.

HUGE RUSSIAN SUNFLOWERS GROWN FOR THEIR SEED.

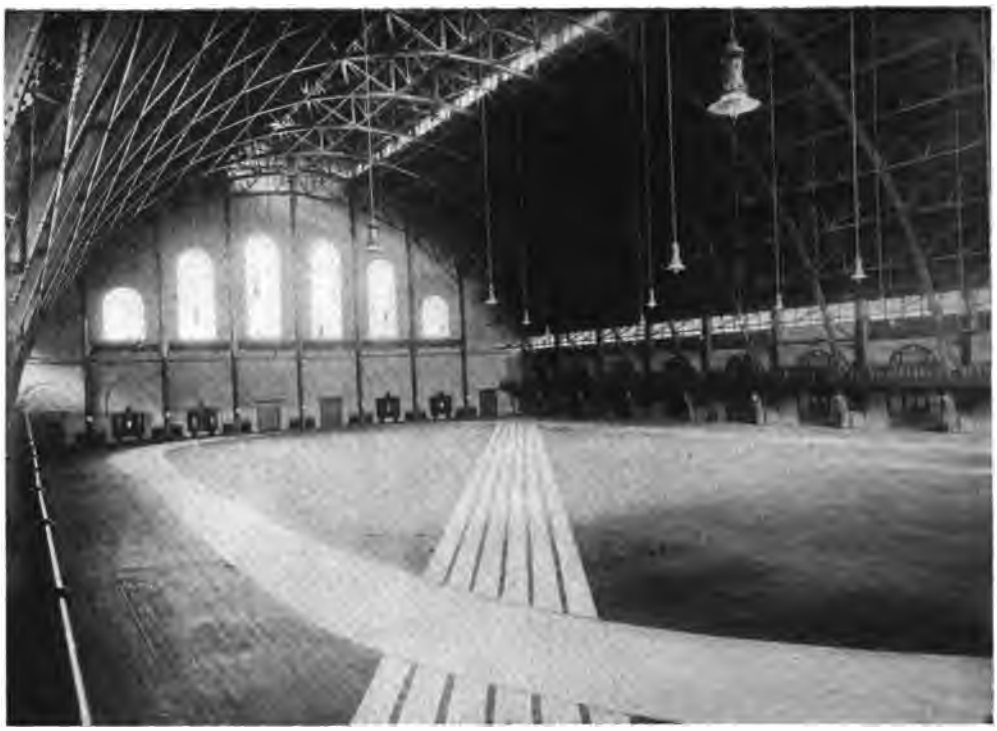
ODD AUTO SCORE BOARD

AT recent California auto road races, a specially designed score board was erected, facing the grand stand, which enabled the spectators to follow the movements of each racing car about the eight mile course. Telephone stations had been set up at half mile intervals around the course where an operator reported as each car passed. These telephones were connected with the judge's stand, where a man was stationed behind the board to receive the reports and to move the numbers representing the cars moving to the black and white spaces that were marked for each half mile. This device added

ODD AUTO SCORE BOARD.
Reports by phone came from every half mile on the course and car numbers were shifted accordingly.

STANDPIPE THAT COLLAPSED.
It was 140 feet high, 20 feet in diameter, and was built of steel plate ¾ inch thick. It belonged to the the Sheboygan, Wis., Water Works Company.

AFTER THE STANDPIPE, FILLED WITH WATER, SUDDENLY CRASHED TO THE EARTH.
No satisfactory solution of the cause of the disaster has been given.



WHERE DEMOCRACY WILL NOMINATE ITS LEADER.
The Fifth Regiment Armory, Baltimore. Here the National Democratic Convention will nominate the candidates for the presidency and vice-presidency.

greatly to the interest of the contest, for the crowd was able to tell just what cars were due to pass, and whether they were coming singly or in a bunch. As one car would pass another on the opposite side of the course, the fact would be recorded by means of the shifting numbers, so that even when no car was in sight, the interest and excitement were maintained. The photograph shows how it works: car number 34 is shown passing the grand stand, and its number on the board is entering the last mile, while other cars are recorded at various parts of the course.

TOOTH OF A GIANT SHARK—A SPECIES LONG EXTINCT.
This was found in the mines of the West. No shark today has teeth more than a sixth this length.

This system is valuable in case of accidents, as the telephones were connected with the field hospital, where a motor ambulance stood in readiness. It is, in the manner in which the results appear, based upon the electric sign-boards used in the leading cities of the country to give the baseball "fans" a genuine reproduction of a game when the home team is playing in some other city. The same sort of device has been used, though more crudely, to illustrate the progress and status of football games. If its use spreads it should prove to be very popular.

FELLING A CHIMNEY LIKE A TREE

THIS stack, which was thrown, stood ten feet square at the base, and one hundred feet high, was built of common brick, lined with fire brick and was topped out with a cast iron cap.

It will be seen that the method of throwing this stack was quite similar to that of cutting down a large tree. Brick work on one side was cut out, extreme care being taken to make the cutting symmetrical on each side of the center line of the stack. This method of cutting was continued until the weight of the stack began to crush the brickwork at the edge of the cutting, and as soon as this occurred the great hill of bricks of course fell to that side.

CUTTING AWAY THE BRICKWORK AS LUMBERMEN WOULD THE BASE OF A TREE.

So accurately was the work done that the fallen stack lay exactly parallel with the sidewalk, as was intended. The outer shell crushed downward, while the inner lining maintained its original shape until the falling stack struck the ground when it, in its turn, also collapsed.

This stack stood at Cleveland, Ohio. It was removed in order to make room for a large new incandescent lamp factory.

This method of felling a brick stack, of course, has to be very carefully understood and thought out by the man in charge. If this be not the case a serious disaster may be the result, as a falling stack surrounded by houses is very different from a falling tree in a forest, many miles away from a habitation.

SUBMARINE JOURNALISM

AMONG the curiosities of American journalism is a newspaper published in a sink of the Colorado Desert in California, at the little town of Thermal. By reason of the depressed place of issue, the editor calls his sheet "the Submarine," and prints under the title the descriptive line, "most

THE STACK ON FALLING LAY PARALLEL WITH THE SIDEWALK, AS HAD BEEN PLANNED BY THOSE IN CHARGE OF THE WORK.

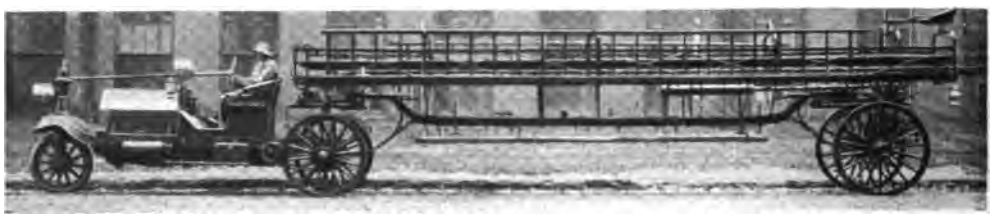
THE FRONT PAGE HEAD OF THE "*COACHELLA VALLEY SUBMARINE*," THE "LOWEST DOWN PAPER ON EARTH."

low down paper on earth—published 122 feet below sea level—weekly."

"The Submarine" first saw the light as a 4 by 6 folder in a tent at Indio, also in the Colorado Desert, but higher up, that is, at 22 feet below sea level. That seemed pretty low down for a newspaper, but with the opening of the Imperial Valley further down the desert and the establishment of newspapers there first at 67 feet and then at 116 feet below, the claim of "the Submarine" as the most "low down" had either to be given up or the paper had to move more "low down." It moved—first to Coachella, 76 feet below sea level, and later to its present abiding place, 122 feet below, and its claim to "low-downness" there is none up to the present time to dispute.

In its younger days this desert journal was printed on paper of a marine blue tint, and ran a humorous column appropriately conducted by McGinty—the character who was famous in popular song a decade or so ago as having dropped to the bottom of the sea. Local happenings were recorded under the head of "Along the Coral Strand." With increase of years, however, these touches of fancy have been discontinued and it has grown more conservative.

A NEW USE FOR SEAWEED.
These little figures are the work of a clever Los Angeles woman. They are made from seaweed.



GAS MOTOR TO DISPLACE HORSES FOR DRAWING FIRE APPARATUS.
This hook and ladder truck was built in 1861, being the oldest that could be found for the purpose of demonstrating the safety with which old apparatus could be handled by the tractor. The test was made at Springfield, Mass.

NEW MARINE MOTOR-CYCLE

A CALIFORNIAN has invented a mechanical attachment whereby an ordinary motor-cycle may be made into a rapid and practical craft for rivers, etc. It is composed of two canoe-shaped, metal floats, 14 feet long and 16 inches wide, which fasten on a light, steel tube frame and contain three air-tight compartments. These floats are carried one on each side of the bicycle and are balanced evenly. The front of the frame is attached behind the handle-bars, without interfering with the steering of the machine. The back frame is attached to the axle of the rear wheel, by a common tandem nut. Four hinges fasten these floats to the frame, in such a manner as to permit them to settle in the water or reverse on the land. The lowest part of the frame reaches to within six inches of the ground.

To turn the hydro-motor-cycle into a water craft, the floats are reversed on their hinges and clamped down by two steel tubes, which are carried alongside of the floats. The propeller drive contains a clutch, which operates backward or forward, with a three foot shaft of three-quarter inch steel. At the end of this is a propeller with three twelve-inch blades. This is carried behind the seat, when not in use. It is attached by means of one bolt, to the rear frame and is fastened, directly in front of the engine with one nut. It protrudes down, from the engine, when on the water, at an angle of twenty degrees. The top blade is just covered by water. The steering is accomplished by two small rudders, on the back of each float. They are connected with and steered by the handle bars. These rudders, working simultaneously, are fastened to the front wheel by two flexible wire cords. Two small rubber-tired wheels, at the rear of the frame, help to carry the weight of the floats, on land. They also keep the machine from tipping sidewise.

The necessity that the inventor met with, at least once, possibly many times, in his lifetime, to suddenly change from land to water travel no doubt actuated him in going about and setting to work to construct such a contrivance as he has produced. It can be seen to be a very ingenious affair, if a proper and careful study of the apparatus be made. So many factors had to be taken into consideration—lightness, simplicity of parts, quick adjustability from one form and one use to another—that the inventor, it will be noted, had his problems to deal with.

AN ELEPHANT SHREW AT THE LONDON ZOO.
It is a South African importation. As the name implies, it has a curious and mobile elephant-like trunk or snout. The hind legs, very long, suggest those of a kangaroo. It hops along on these with great speed. It is about the size of a dormouse.

FOR LAND AND WATER TRAFFIC.

A REINDEER-DRAWN SLED.
This curious spectacle may be witnessed in the private park of an English country gentleman, who is noted for his trained pets.

SKULL OF THE FEROCIOUS WOLF FISH.

THE SPIRAL CATAMARAN

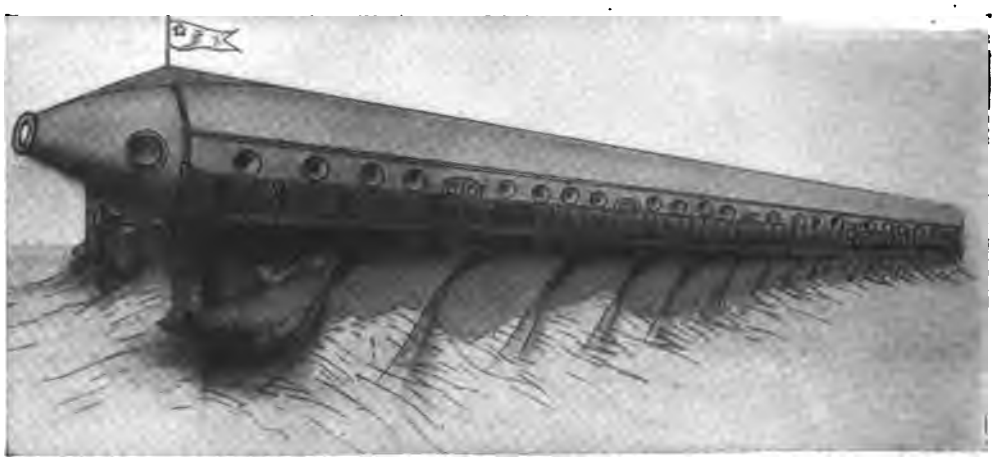
A PRINCIPLE absolutely unique in boat construction is now being used in Los Angeles, where a working model has been successfully operated, and where a full-size passenger carrying craft is being constructed. It combines the principles of the catamaran, or double hull, with a propeller system that is unique. The latter consists of spiral flanges running the entire length of the thirty-foot floats which support the superstructure. These floats are of metal with airtight compartments and are cigar-shaped. They revolve on bearing at the points, where they are held by a steel frame. As they revolve, the spiral flange, which is set at an angle of thirty degrees to the cylinders, pushes the craft through the waters with great force. The inventor claims that ninety per cent of power ordinarily lost in water resistance will be converted into forward energy, as the resistance is removed by the spiral flange, and nothing but the revolving cylinders is in contact with the water. The idea is so original that its working in a full sized pleasure craft will be observed with unusual interest. Gas engines on the superstructure will supply power.

FIERCEST OF FISHES

THE skull of this fish suggests a likeness to the bulldog—and not inappropriately, inasmuch as it is exceedingly ferocious. Dr. Theodore Gill, of the Smithsonian Institution, says that it is much fiercer than any shark.

It is known as the "wolf fish," and frequents shallow waters along the coast of Maine. Now and then it happens that somebody is attacked by a specimen.

WATCH IN A PEARL.
This is the feat of a Swiss jeweler. The pearl weighs 45 grains. The sale price of this rare novelty is $6.000.



HOW THE PROPOSED NEW CATAMARAN WILL LOOK IN THE WATER.
This is the idea of a Los Angeles inventor.

WHEN A FIRE BREAK HAS THUS ONCE BEEN FORMED THE GOATS ON THIS RANGE MAY BE DEPENDED UPON TO KEEP IT CLEAN.

THE REVERSE SIDE OF THE PEARL-INCASED WATCH.

FIRE BREAKS KEPT CLEAR BY GOATS

IN order to keep weeds from destroying the usefulness of the fire breaks in California forest reserves, goats are being pastured free of charge by the government in order to keep down the growth of weeds and brush. Goats will perform this service while picking up a living, thus saving the forest service thousands of dollars every year, which would otherwise go to gangs of men armed with hoes and other weed exterminators. Such small growth is a serious menace in case of forest fires, as during the dry season they will carry the flames right across the barrier designed to check them and then no one knows what will happen.

At least 2,000 goats can be used on one forest reserve alone in California, and as the experiment has proved successful where tried, it will no doubt be adopted on other reserves in the near future. The cost of forming these clear spaces along the ridges is considerable, as a space fifty feet wide or so must be cleared of brush and trees, the width of the fire break depending upon the height of the forest thereabout.

ALL GRASS AND WEEDS HAVING BEEN CLEARED AWAY THE GOATS ATTACK LOW-GROWING SHRUBBERY.

THE SMOKE BOILED OUT FROM THE TOP OF THE BURNING OIL TANKS IN GREAT DARK BILLOWS.

SMOKE AND FLAME ROSE SKYWARD FOR A QUARTER OF A MILE.

The burning of twenty-seven oil tanks at one time presented a terrible and magnificent spectacle.

PROTECTION FOR SPARE TIRES.

Cases for spare tires have been devised by a Californian, which protect from light, moisture, dust and grit, the latter being likely to settle in an unprotected casing and causing punctures by contact with the inner tube. The new case is protection against theft as well, for it is fitted with a lock and made of sheet metal. When enameled and painted the same color as the car, it is more attractive than the old-fashioned covering, and it has the additional advantage of being quickly opened and closed, as there are only a couple of snaps to open instead of a score.

TWENTY-SEVEN OIL TANKS IN FLAMES

ONE of the most spectacular fires ever witnessed in southern California was caused by the explosion of a still in the plant of the Hercules Oil Refining Company of Los Angeles, which ignited twenty-seven tanks of oil. The explosion occurred at half past eleven at night and completely wrecked the plant, sending up smoke and flame to the height of a quarter of a mile. For thirty-six hours the great steel tanks seethed and bubbled like enormous caldrons and the smoke hung over the city and adjacent country like a storm cloud.

As there was no way of extinguishing a fire of this sort there was nothing to do but let it burn itself out. The loss is estimated at a quarter of a million dollars.

GIANT LIFE-SAVING MATCH

THIS is not merely a safety match; it is a life-saving match. Six times as big as an ordinary match, it is used by the government's Life Saving Service for very practical purposes. There are, for instance, occasions when it is necessary to light a fuse that sets off a gun or mortar, from which a projectile is discharged to carry a line over a sinking ship off shore. Perhaps the wind is blowing hard, and it may be raining. What is needed is a match that will not go out.

This is a match of that kind. Wind will not blow it out; water cannot put it out. Provided with a few such matches, the life guard who patrols the ocean beach or the lake shore can never be without fire, if only to light his pipe.

NOISELESS MOTOR CYCLE

A NEW electric motor cycle not only is said to do away with nearly all the other undesirable features of this child of the auto, but with noise as well.

MACHINE TO SCARE WOLVES.

The accompanying photograph shows a rather unusual invention, designed and constructed by E. C. Winchester, of Thermopolis, Wyoming. The instrument is intended for the protection of sheep against coyotes—the wolves of the prairies—and other predatory animals. The principal feature of the contrivance consists of a revolving search light, and the automatic explosion of a blank cartridge at intervals of every half hour. The power is furnished by a huge spring within the mechanism, and will run for a period of ten hours without attention. The machine will be manufactured similar to the model shown with the exception of an encasement of the interior parts, as a protection against climatic conditions. Patents have been applied for.

"NO TIP." OBSERVE THE MARK ON THE SUITCASE.

The employees of European hotels are said to have a perfect system of marking the baggage of guests to inform their colleagues in other places whether they may expect tips or not. As soon as the porter and the waiters see the baggage they know how to treat the guest.

MOTOR CYCLE THAT IS SAID TO BE NOISELESS.

GIANT MATCH USED BY THE LIFE-SAVING SERVICE

Water will not extinguish it. It is six times the size of an ordinary match.

A CURIOUS FIRE-ESCAPE.
It is simple, but the average woman making her first descent will no doubt have a few more qualms than has this experienced operator.

There is no spattering of grease, no disagreeable odor, and no excessive heat such as comes from the engine of the gasoline machine.

An electric motor mounted in the frame of the cycle just under the seat of the driver, drives the machine by means of a chain and sprockets, the power being applied to the rear wheel.

The battery is carried in the frame in the usual position of the engine of the gasoline motor cycle.

The new machine fully equipped weighs 225 pounds and is arranged to run at three speeds, four, fifteen, and thirty-five miles an hour. The motor is wound for a twelve volt current.

The machine can be equipped with a high power electric headlight when desired, and it is claimed that one charge of the battery is sufficient to operate the cycle for one hundred miles over good roads.

SCOUT TO WARN THE AUTO SCORCHER.
Employed by the motor associations, the scouts are posted along the highways and warn speeders of traps and other hidden police dangers in rural England.

THE WONDER CROP, BLACK EMMER

THE farmer who has to contend with both late and early frosts as well as the arid lands of the West where water is very scarce, finds it difficult to raise the native grains of America. These conditions are generally understood by the rancher of the West, who is eager to find substitutes for the native grains. Such a grain is black emmer.

Black winter emmer has been imported into this country from Russia, where it has been grown extensively and with wonderful results. It is a strictly winter grain resembling our barley in its appearance but it is a relative of the wheat, having almost the same food value, for stock.

Prof. B. C. Buffum of Worland, Wyo., has made perhaps the most successful experiments with black emmer. Professor Buffum has developed an improved winter emmer which he obtained from crossing the common black emmer with a winter wheat, which is a hardier plant than either of its parents and a much larger yielder.

The emmer as developed by Professor Buffum grows about five feet high on an

A SHRAF OF BLACK EMMER.

IN A FIELD OF BLACK EMMER.

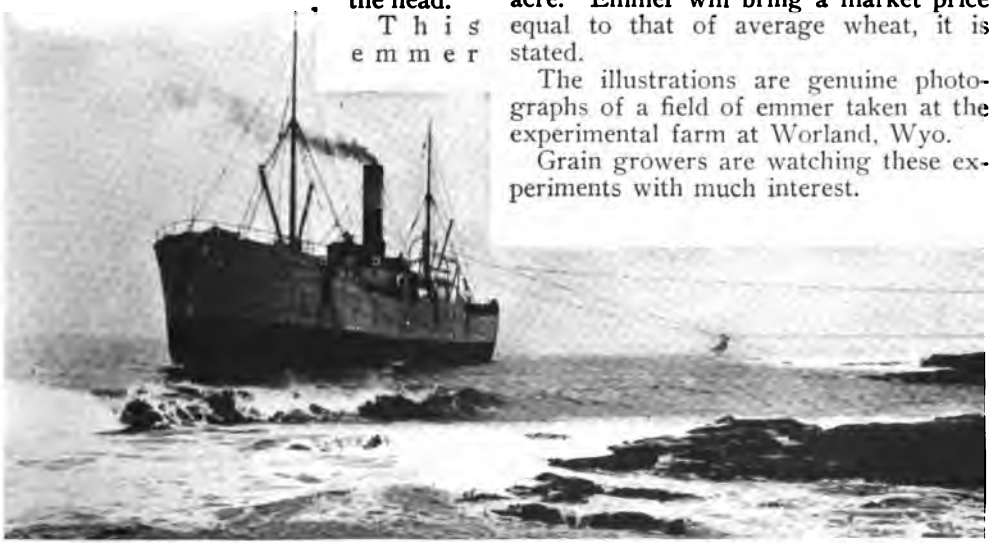
TESTING THE COAST DEFENCE POSSIBILITIES OF NEW YORK CITY.
Battery in action at Fort Totten.

average and develops from 10 to 35 stalks from one seed, each stalk has a large head averaging about 45 grains or kernels to the head.

This emmer will stand the severe cold of the winter and requires but little moisture compared to the wheat, and under favorable conditions will yield about 70 bushels to the acre. Emmer will bring a market price equal to that of average wheat, it is stated.

The illustrations are genuine photographs of a field of emmer taken at the experimental farm at Worland, Wyo.

Grain growers are watching these experiments with much interest.



BIG AUSTRIAN STEAMER *GRADAC*, WHICH RAN ON THE ROCKS OFF THE NORTHEAST COAST OF ENGLAND.
The photo shows the life line in use.

A GREAT LINE OF ILLUMINATION TRAVELING OVER THE FACE OF THE OCEAN.
Our North Atlantic squadron as it appears at night.

AUTOMATIC CHANGE-MAKER

THIS machine is designed to supply change for coins of larger denomination with absolute accuracy, without the requirement of any manual manipulation, such as keys.

The change-maker is mounted on top of a pedestal when arranged for receiving fares on street cars, etc., or admissions to shows, theatres, etc. The change-maker is operated either by the hand lever or foot lever. All coins for which change is required are dropped into the one slot shown at the upper left-hand corner, the coin being stopped by a gate in position to be manipulated by movable plate above, actuated by the operating lever. The lever being depressed, the coin is forced downwardly and to the left against a yielding plate which latter sets a sliding bar in position to eject coins from the coin stacks as shown. The various sizes of coins set this plate in various positions whereby selection of the particular coins to be ejected is made. It is an ingenious arrangement.

AN AUTOMATIC CHANGE MAKER.

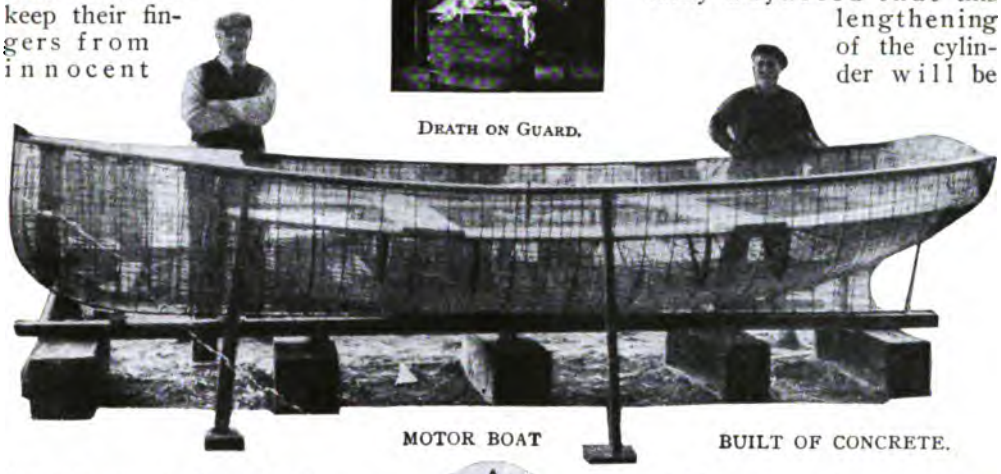
The lower part of the arc of travel of the operating lever is used for ejecting the change into a cup, shown below in the middle of the machine, from whence it is removed by the hand. The fare or admission is then selected and dropped into the fare box below. The return of the operating lever to rest deposits the admission coin in the pedestal out of reach of the operator and returns the parts of the change-maker to positions for receiving and making change for another coin. If a coin such as 5c, 1c or $5.00 is dropped in the slot, a partial depression of the lever locks the mechanism and prevents the ejection of any coin and the only alternative is for the operator to slightly raise the operating lever above its point of rest, whereby the coin is passed into the delivery cup without further action of the machine. The inventor has high hopes for his device.

HOW THEY KEEP THE TABLES OF THE LAW IN MANDALAY, INDIA.
There are 450 pagodas containing the native laws of the country engraved on marble plates.

DEATH AT THE SWITCHBOARD

A STRIKING danger signal was set up by a Western electrician who was expecting a party of visitors to go through his plant. Knowing that accidents might occur if his guests did not obey instructions to keep their fingers from innocent looking wires, he placed a huge "danger" sign on the switchboard and beneath it a grinning skeleton. This was the first sight to meet the eyes of the visitors, and they were careful to obey instructions in consequence.

DEATH ON GUARD.



MOTOR BOAT BUILT OF CONCRETE.

AUTOMATIC GAS LIGHTER

COL. GEORGE W. GOETHALS, in charge of operations on the Panama canal now proposes to put the sun to work.

His innovation is a valve, operated by the sun's rays. Colonel Goethals intends to use it in the operation of the range lights being placed in the broad reaches of the canal. Many of these lights are to be located at isolated points, making it costly for an attendant to visit them twice each day, to turn the gas on and off, or to leave them burning night and day.

The sun valve consists of a large copper cylinder covered with lampblack. The black surface absorbs light, converting it into heat, thus causing slight expansion of the cylinder. The apparatus is so delicately adjusted that this lengthening of the cylinder will be sufficient to work on a lever shutting off the supply of gas. With the approach of darkness, the light that has been absorbed will be given off, cooling the cylinder, and causing a contraction sufficient to open the gas valve. A small pilot light, left always burning, will reignite the gas for the main light.

THIS VALVE TURNS OFF AND ON GAS LIGHTS BY THE ACTION OF THE SUN'S RAYS.

CONCRETE MOTOR BOAT

THE illustration shows the frame work of a small motor boat built by Mr. A. Last of Enkhinzen, Holland, over which a coating of concrete one-half inch thick was laid. Over this five coats of water proofing material was laid and the boat then used successfully.

The frame was made of iron covered with 1½ inch mesh, 1/16 inch wire netting. A

HOW A BUILDING WAS MOVED IN MAINE DURING THE PAST WINTER.
The structure shown was moved five miles in this manner.

pair of 13/16 inch steel beams supported the engine. These were fastened in place to the frame about ten days after applying the cement, so that in setting it might adapt itself to the added strain due to the weight of the engine.

After fifteen weeks the boat was launched and during the balance of the season withstood the jolts and jars common to such craft without showing any sign of cracking.

The boat is 14½ feet in length with a 66 inch beam, and is 22 inches deep. It is equipped with a three horsepower gasoline engine and attains a speed of seven miles an hour under ordinarily good conditions.

AVIATORS IN SOUTHERN CALIFORNIA RECENTLY TOOK PART IN A HUNT FOR CRIMINALS.
They were unable to locate their quarry, however.

HOW THEY MOVE BUILDINGS IN MAINE

SNOW in Maine is considered a great asset to the state in winter and this is especially true in the moving of buildings. Nearly all this work is left until the snow comes each fall and then it is kept up for nearly three months. It has been known for a building that weighed ten tons to be placed on sleds and moved ten miles with a pair of oxen. It is not unusual to see a building that is forty feet wide and sixty feet long being moved on sled runners with a number of pairs of oxen hauling the building. In one large town a hotel that was three stories high, 150 feet long was moved half a mile on sled runners. There is saved in the state each year many thousand dollars by hauling buildings in this way in the winter time. Many times if the building was to be moved in the summer the slow process of moving it on rollers would make the expense greater than the value of the building and it would have to be torn down instead.

Snow to the New Englander at least is a wind not altogether ill for it blows somebody good in that inclement region.

A FRENCH NOVELTY—MODEL ELECTRIC RAILWAY TO CONVEY DISHES TO AND FROM THE TABLE.
Bringing in the dinner.

THE MYSTERIOUS FROGS

MR. DAVID FAIRCHILD has an extensive reputation amongst scientific men as one of the chief missionaries of the U. S. Department of Agriculture. Around Sarita, one of the largest ranches in the southern part of Texas, he is known as an honorary twin brother to Sherlock Holmes.

A few years ago the ranchers of Sarita were nonplussed by the discovery of frogs and fish in some lakes whose only source was artesian. The pseudo-scientists of the neighborhood waxed very fertile. Some of their suspicions were: underground rivers tapped by the wells; suspended animation of the eggs that had waited years for the water to set their energies free.

Mr. Fairchild stationed himself near the lakes and awaited results.

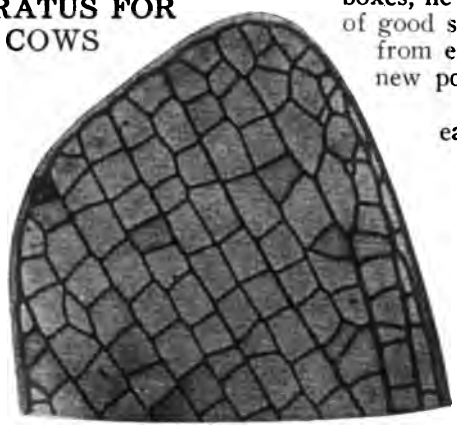
One day a flock of ducks alighted for a rest and a bite to eat, and with the image of them a great light passed into Mr. Fairchild's mind and he saw everything clearly. The ducks had, of course, visited other ponds not of artesian origin, they had there waded in muddy shallows where the eggs of fish and frog are deposited in millions; and smeared with some of this fertile mud they now washed themselves clean in the virgin waters, and thus became the pioneers of an advance community. Mr. Fairchild learned that no less a nature observer than Charles Darwin was on record as verifying the fact that water birds are frequently the carriers of fish eggs from one pond to another.

THE COOK LOADING THE TRAIN.
M. Hagnauer, a French scientist, is the inventor.

DANISH INVENTOR CONSTRUCTS NEW MILKING MACHINE.

LATEST APPARATUS FOR MILKING COWS

THIS milking apparatus is put in operation by moving the big handwheel shown in the illustration. By doing so, a vacuum is obtained in the hose connecting the cow's nipples with the tank, placed between two cows. When the tank attached to the back of the cow is filled up, the content flows in the bigger one connected to it through a pipe. One man is able to tend to ten animals at the same time and this means a large saving for the farmer. It is obvious that by milking cows in this manner, the milk is prevented from becoming impure from dust and other things which are liable to fall in it.



MOSAIC WORK IN THE WING OF A GRASSHOPPER. This, under a compound microscope, is remarkably beautiful because it is iridescent of the many colors that give the effect of changeable silk.

RAISING POTATOES WITHOUT A GARDEN

A MAINE man has devised a scheme for anybody without a garden plot or time to carry on a garden to raise his own potatoes and get them earlier than they are found in the markets. Before the frost is out of the ground in the spring he has prepared three hundred boxes each about two feet high and a foot wide, without bottoms to them. He takes a large box ten by eight feet and places it in his cellar. He puts into this box two bushels of potatoes, and covers them with straw and leaves them there for three weeks. As soon as the snow is gone from the ground, which is usually in early April in this section, he takes his potatoes out, which meantime have sprouted, and placing these individual boxes along in a row on the ground, preferably in a sunny place, he puts into each of them two potatoes and covers them with four inches of straw. He then leaves them until the middle of June when digging into his boxes, he pulls out new potatoes of good size. One box contains from eight to fifteen of these new potatoes.

This method assures early potatoes. It saves the expense of plowing, cultivating, bug-fighting, and even of digging.

The plan might easily be utilized by the city dweller, with his very limited back-yard area. Even the flat dweller might be able to raise his own "new" potatoes and thus cut expenses in this era of high prices.

POTATOES PLANTED OUT IN BOXES.

HATCHING CHICKENS BY ELECTRICITY

IN the city of New Orleans there are in use many chicken incubators and brooders heated by electricity.

Of course outside the limits of electric supply they would be useless. The full current is supplied and the power is regulated by a thermostat, so that it is made to give whatever heat is desired. An electric lamp indicates the current on the outside and inside there is a small lamp that may be turned on at any time for reading the thermometer and watching the hatching through the glass front of the incubator.

The incubators have walls of steel, which are filled in with cork. The temperature is kept readily at 103 during the whole 24 hours for each of the 21 days required to hatch the eggs. The incubators require no further care than watching the thermostat and taking out the trays for about five minutes every day to air the eggs, so that they furnish a very simple method of bringing little chicks into the world. They may be kept in a cold place; it makes no difference at all and even a cold storage plant would not affect the temperature of the interior; neither would the heat of a very hot place.

HATCHING CHICKENS BY ELECTRICITY.

MACHINE FOR SPRAYING SMALL FRUITS AND VEGETABLES.

This is useful in protecting strawberries, raspberries, blackberries, potatoes, tomatoes, etc., against insect pests. This picture was taken at Atlanta, Ga., where it was used in truck gardens and on farms where much spraying was required. The pump on top of the machine is operated by a chain attached to a sprocket wheel as shown in the picture.

PURE WATER FOR THE HOME

FOR purifying water for domestic purposes a simple device, to cost not more than five dollars has been invented, its great advantage being that it not only clarifies the water but also destroys all organic life and precipitates the harmful minerals held in solution.

The invention consists of a couple of aluminum rings, a pair of insulators of hard rubber and the necessary wires to connect it with an electric light socket. The rings are of such dimensions that one fits within another, the outer one being about eight inches in diameter with a length of four inches and the inner one being of about four inches diameter and three inches in length. They are of sheet aluminum and the sides are perforated. When properly wired they form an electrode and when operated are placed in a vessel of water containing about three

THE ELECTROLYTIC WATER PURIFIER.

SECTION OF THE MAIN MAST OF THE *MAINE* AT THE WASHINGTON NAVY YARD.
The mast will be erected over the graves of the ill-fated vessel's dead in Arlington Cemetery.

gallons and the current is turned on for a few minutes.

The electrolytic action releases the oxygen in the water and as this gas has an affinity for the various minerals which it contains, such as magnesium, sulphate of lime, etc., it causes their precipitation. All bacteria are attacked by the oxygen and destroyed, so that the most minute microscopic search fails to reveal any trace of the deleterious organisms. The water is allowed to stand for three hours after the current is turned off, when a whitish sediment is observed at the bottom of the vessel. This is drained off and the water which remains is chemically pure.

THIS TURN TABLE ON A MOUNTAIN ROAD HAS SAVED THOUSANDS OF DOLLARS IN ROAD WORK.

TURN TABLE FOR MOUNTAIN ROADS

BY an ingenious plan which has been carried out by the builders of a toll road in Colorado the sight-seeing automobiles, which they operate, can be turned within their own length by the use of a turn table. While a turn table is not in itself remarkable, its utilization in this way is interesting, and as it saved several thousand dollars worth of road work and blasting out the side of a cliff, it is a very practical idea. This turn table stands at an altitude of 7,945 feet, on a point of rock which commands a wonderful view of Pike's Peak and Colorado Springs and hence is known to thousands of summer tourists.

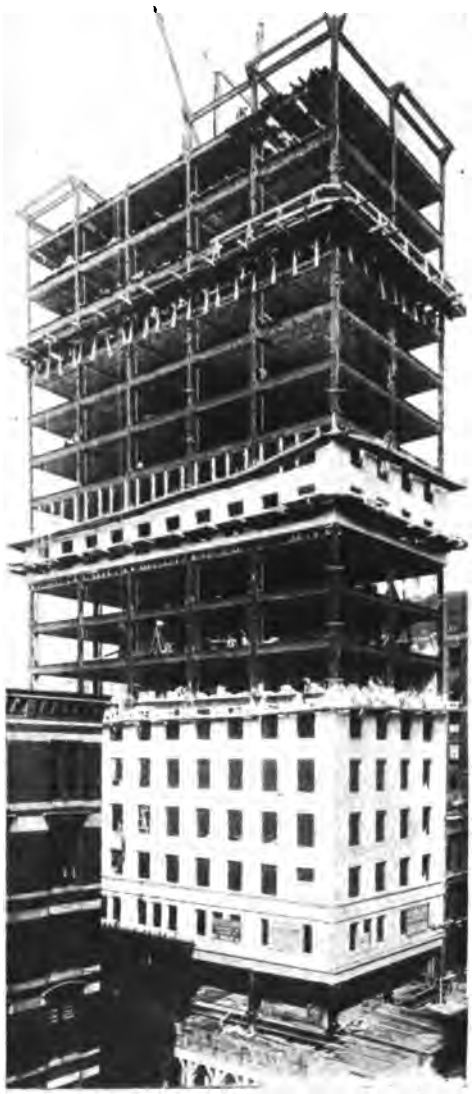
HINDUS PERFORMING RELIGIOUS SERVICES AT THE SACRED CITY OF BENARES.
They assemble by the tens of thousands to do homage to Buddha.

TOOTHLESS ANIMAL EATS ANTS

A GENTLE animal, easily tamed and of affectionate disposition: that is the description a writer gives of this scaly monster, the pangolin or ant-eater of the Congo country, Africa. Its Malayan name of pangolin—for it is found in the East Indies also—means to "roll-up," the animal having the habit of rolling itself up on the apprehension of danger, into a compact ball, the head in the center, and its muscular, mail-covered tail enfolding all. The creature herewith shown was one of three that were recently brought out of the African jungle by an explorer. Its companions, however, did not survive the abrupt and distinct change of habitat.

The food of the pangolin consists almost solely of ants, as despite his ferocious appearance, he has no teeth. It has as a substitute a remarkably round and prehensile tongue. On the other hand its claws are strong and sharp, being chiefly used in digging up the huge ant heaps of central Africa, or in digging burrows for itself, in which it hides. These burrows are seven or eight feet below the earth's surface. It can also climb trees. When uncoiled the pangolin presents a formidable appearance. It has

"EASILY TAMED AND OF AN AFFECTIONATE DISPOSITION."—THE PANGOLIN.



SAFETY SCAFFOLDS IN POSITION ON A SKYSCRAPER.

a length from the tip of its nose to the tip of its tail, which is also prehensile, of five feet.

TO CONSERVE LIFE AND LIMB

THE erection of each of the recently built skyscrapers has taken its toll in human lives, while masons and bricklayers were working on wooden scaffolds supported by horses and cantilevers of the usual style.

A new scaffolding has been designed which protects the workmen on skyscrapers and on other lofty elevations to which they must in the course of their operations ascend.

The scaffold is divided into sections each ten feet long. At the end of each section is a pair of winches. They are composed of a drum around which wire rope is roved, and the necessary supporting members. The upper end of the rope is secured to an outrigger by an anchor bolt, thus securing the support of the scaffold. To the drums are secured rachet wheels. A lever serves to actuate a pawl, which raises or lowers the scaffold by means of the ratchets. The ratchets serve to turn the drum which winds up the cable. As the sections are very small, a man can raise one section very quickly by a few strokes of the four levers at each corner. By this safety scaffolding it is possible to lay bricks at any story without risking the life or limb of the workmen, who but too often are imperiled.

HOW THE SAFETY SCAFFOLD APPEARS FROM ABOVE.

"UDO" OR JAPANESE LETTUCE

ONE of the new and valuable vegetables just beginning to appear in the markets of this country is called "udo," and comes from Japan, having been fetched from thence not long ago by one of our agricultural explorers.

This "udo" is not distantly related to our own lettuce. It is exceedingly good to eat, in salads or otherwise prepared, and will doubtless prove a very acceptable addition to our list of good things to eat.

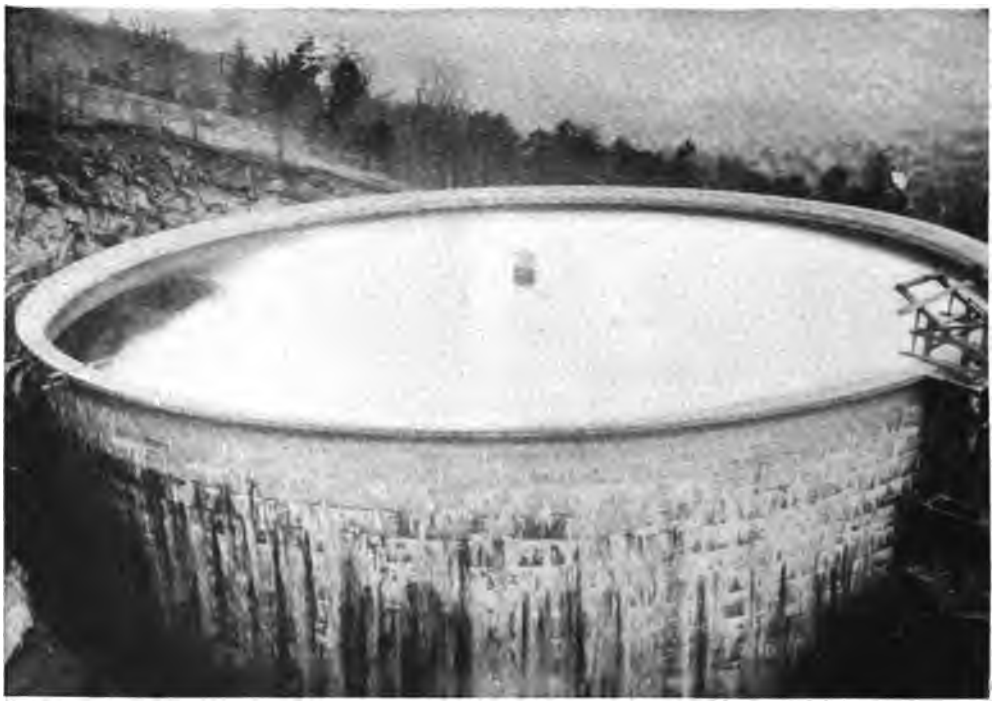
This kind of lettuce is bleached by growing it under tile cylinders such as the stooping man holds in his hands.

"UDO," THE NEW LETTUCE INTRODUCED FROM JAPAN.

LAST OF THE BUFFALO ROBES

THE War Department has decided to dispose of the only genuine buffalo coats that remain in the country in any large quantities. There are 4,300 of these coats, which were formerly worn by soldiers in their campaigns during blizzard weather, when Indians were troublesome and had to be followed

MINIMUM PRICE FOR THIS COAT, $25.
A genuine buffalo robe.



CONCRETE RESERVOIR THAT HOLDS FIVE MILLION GALLONS.
It was built to insure an auxiliary or emergency supply for the water system at Ashville, N. C. It measures 150 feet in diameter and is 40 feet deep.

THE CURTISS NEW TYPE "FLYING BOAT" AFTER IT WAS LAUNCHED FOR THE INITIAL TRYOUT AT SAN DIEGO, CAL.
It can make 50 miles an hour on water, or 60 miles in the air.

through blinding storms. The coats are at the army depot in Omaha, Neb. Some are to be sent to the army quartermasters in Philadelphia, New York, Boston, Seattle, St. Louis, Chicago, Omaha and St. Paul. The overcoats are to be sold to the highest bidders, individual bidders being given the preference. The minimum price for any one coat will be $25, which is the wholesale price paid by the government in the old Indian days. The picture on page 361 shows the equipment of one of the soldiers in the days when these coats were worn. The figure is in the army museum in Philadelphia.

THE LATEST FASHION IN PARIS.
This is a fan of violets, lilacs and carnations folded to resemble a bouquet.

HOW PREHISTORIC MONSTERS FOUGHT AND FED

THERE is now on exhibition at the museum in New York, a skeleton of a large carnivorous dinosaur. Following the policy of the museum, Prof. Henry F. Osborn, who directed the work of this reconstruction, departed from the traditional of mounting, for the flesh-eating animal is here poised as feeding upon the vertebrae of his victim, a huge brontosaurus, a herbivorous contemporary considerably larger than his carnivorous foe. These bulky, slow-moving brontosaurus, seventy to eighty feet long, without any armor or apparent means of defense, were hopelessly outclassed and probably easily overcome in battle by the fierce dinosaurs. Additional interest surrounds this specimen, as large carnivorous dinosaurs are exceedingly rare. Though three or more distinct types of dinosaurs lived at the same time and in the same region, the remains of the herbivorous ones have been the most frequently discovered, while the flesh-eating dinosaurs have been found only in a few instances. In this mount, Prof. Osborn has scored a two-fold paleontological triumph in the innovation of representing a fossil skeleton in action.

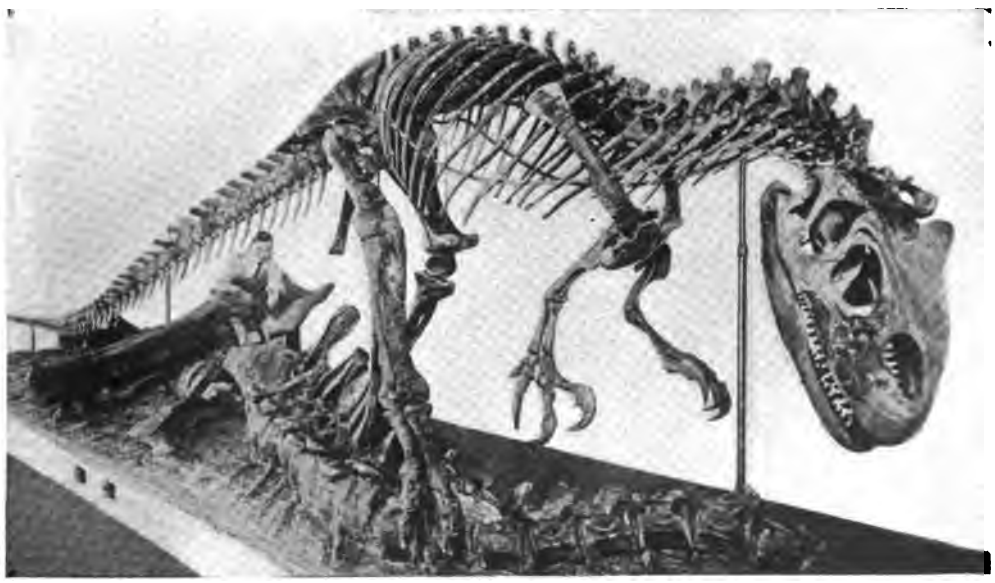
OUTDOOR ROOM FOR THE BABY

"KEEP the baby out of doors! Let it sleep in the open air!" This is an order many mothers are getting, but how to do it and at the same time attend to their work in the house is a problem that is rather hard to solve.

But when a parent is told that she must do something for "baby's sake" she usually finds a way and consequently a great many ideas have originated in the last few years for keeping the baby safely outside while the mother is not near by to watch it while it is at play.

An enclosure of light wood is built and screwed down upon a low table, which can be moved from one part of the yard to another, the screws allowing

THE AUTHOR-PORTER. Otto Popper, a porter and brass polisher by trade in a Berlin department store, takes to writing after his work. He has astonished Berlin with his first play production "The Salesgirl." Strangely enough he still sticks to his porter job.



THE MOUNTED SKELETON OF THE DINOSAUR SHOWN AS STANDING OVER THE VERTEBRAE OF ITS PREY.

MOSQUITO NETTING PROTECTS THE YOUNGSTER FROM FLIES.

the frame to be removed and everything thoroughly cleaned.

Four pieces of wood projecting outward are secured to the upper corners and on this the netting is arranged so that the little playroom can be completely covered, protecting the child from flies and mosquitoes. A blanket or piece of canvas can be tacked up to keep the sun from the baby's eyes. A mattress covered with canvas gives extra comfort.

In this outdoor room the little one has plenty of space to walk around, and with its toys will amuse itself for a long time until sleep comes naturally from the effects of the fresh air.

OPEN TO THE AIR, BUT HE CAN'T CRAWL OUT.

THE SMALLEST RAILROAD IN THE WORLD.
It has been built by the English in the Himalayas for strategic purposes. The road runs from Siligun up to Darjeeling. The road is 57 miles long, the ascent 7,000 feet.

A VIEW OF THE CITY OF DARJEELING.
The gage of the railroad is but two feet.

THE MEN WHO MAKE THE MAGAZINE

CHARLTON LAWRENCE EDHOLM.

CHARLTON LAWRENCE EDHOLM represents the enterprising, wide-awake spirit of the great West. He notes progress with keen, inquiring eye, and records it with alert, interpretative imagination. Unconsciously, perhaps, he has made himself the historian of the Pacific Coast's material advance for the past decade. The land of sunshine and new hopes is apparently as familiar to him as the neighborhood in which you were born is to you. He lets little of importance go by unrecorded. He recounts everything, from the discovery of the means of exterminating the teredo pest to the completing of the Los Angeles $23,000,000 aqueduct.

But this work, though of unusual breadth and comprehension, does not include all of Mr. Edholm's activity. He has another side —that of poet and essayist—thus instructing and delighting thousands in more than one field of literature.

EDWARD F. BIGELOW.

EDWARD F. BIGELOW, a naturalist, living at his home, "Arcadia" Sound Beach, Connecticut, discovering the wonders of a vast universe through the medium of the telescope, attempts to convey some of these marvelous visions to TECHNICAL WORLD MAGAZINE readers by macrophotography. Mr. Bigelow, in this field, is unsurpassed, if, indeed, he has been equalled.

He is to be envied for the delight his daily work must give him. In direct touch with nature, he carries on, in a systematic, scientific way, researches which many a man would consider to be recreation — a relief from the sterner duties of life. And yet Mr. Bigelow works with all the energy, persistence and patience of the most untiring individual in the world of active affairs. Men who accomplish the results he shows must not only love their work but take pleasure even in encountering and overcoming its obstacles.

Many know the fascination of the microscope; more, the fascination of the camera. It is the privilege of but a few, however, to know the delight of the two combined.

WILLIAM ATHERTON DUPUY AND HIS DAUGHTER, CELENE.

WILLIAM ATHERTON DUPUY was born with a nose for news, that is, scientific news, though he began his literary career as a writer of fiction. Editors, however, did not seem to buy this kind of writing as rapidly as the youthful Mr. DuPuy thought they should, so he abandoned fiction for the more substantial and, at the same time, far more lucrative field of presenting the latest results of the scientific world in popular form.

His brief sketches of men and women who are coming to the forefront in engineering, science and in the life of affairs, are especially strong and telling.

Mr. DuPuy lives in the city of Washington, the news center of America in science as well as in politics. He is alert, aggressive, knows what appeals to this generation of men and women in material development, and, what is equally good, knows how to tell it.

Over and above all this, Mr. DuPuy is essentially a home-loving man.

P. HARVEY MIDDLETON for a number of years has been engaged in the writing of special articles. His articles are always timely, accurate and to the point. He was the first,—in the pages of the TECHNICAL WORLD MAGAZINE over a year ago—to direct attention to the horrors of using white phosphorus in the making of matches. This great and serious menace to the health and lives of men and women working in match factories, has recently, it will be recalled, received drastic congressional action.

Many of Mr. Middleton's contributions have received marked attention. His writings are never less than interesting, and often of vital importance. He is not carried away by his own previously formed opinions, in presenting the results of his researches, but is always unbiasedly open to the facts of each subject he investigates. Despite this open turn of mind nevertheless he can be moved to warmth and vigor. Mr. Middleton is a resident of New York City.

P. HARVEY MIDDLETON.

A REAL LIVE TEDDY BEAR FROM ESKIMO-LAND. This little creature was seen by thousands at Seattle, Washington.

THE GEOLOGICAL SURVEY

THE Directors of the United States Geological Survey have all been accomplished geologists, familiar with the wildest of the wilds in America—Clarence King, Major J. W. Powell, both dead, then Charles D. Walcott, at present secretary of the Smithsonian Institution, and now George Otis Smith. That the head of the Geological Survey should be an eminent geologist might appear to go without saying; yet there are many top-notch geologists who would probably be failures as Directors of the Geological Survey which during the last year carried on its roll nearly 1,000 members. The administration of this big bureau, with its complexity of work, ranging from the purely scientific, such for instance as the study of the fossil plants and snails living ten million years ago, to the strictly practical and economic, such as the valuation and pricing per acre of the government's coal lands, needs a man with a well balanced business head. Great specialists are usually poor business men, and accounting to Congress and Congressional appropriation committees for every dollar of a million and three-quarter-dollar annual expenditure split up into five or six separate specific appropriations—geology and land classification, mineral resource statistics, topographic mapping, map engraving, water resources investigations, and until, now the entire work of the new Bureau of Mines—has been a job requiring unusual executive ability.

The present director, however, as did each of his predecessors, finds time every year to get into the field for a month or two, and then he becomes a plain geologist, and if he attaches himself to a survey field party, roughs it with the rest of them just as if he were a mere field worker.

THE HEAD OF THE GEOLOGICAL SURVEY ON HIS VACATION.

DEVIL-FISH CAUGHT NEAR MANZANILLO, MEXICO, THAT WEIGHED OVER A TON.

MONSTER DEVIL-FISH

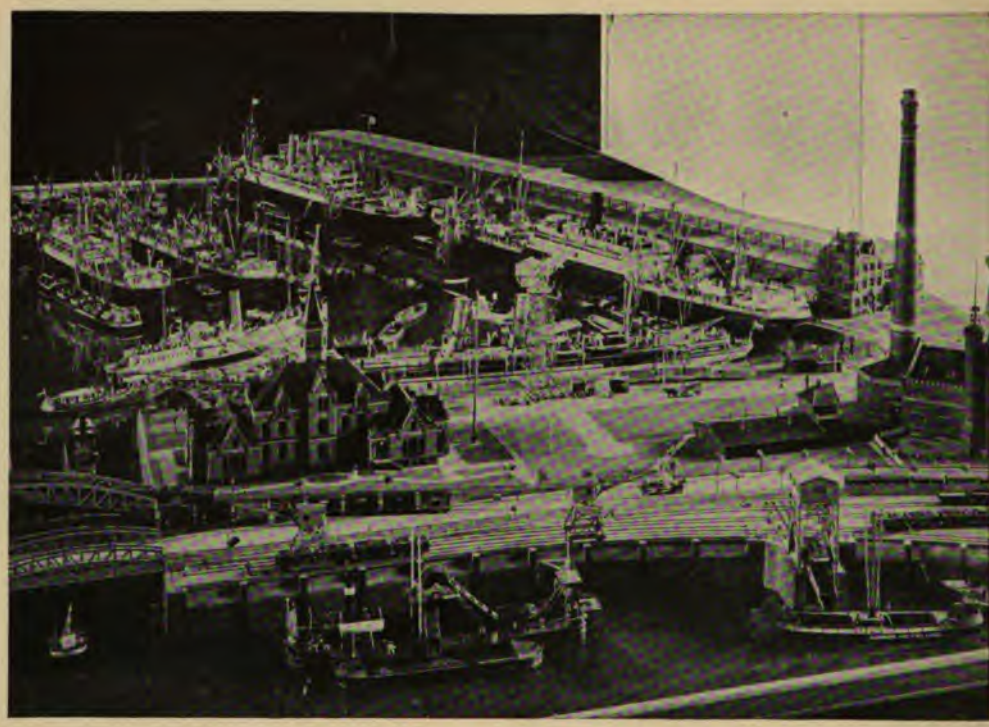
THERE is probably no more remarkable form of fish-life than the manta, or ray, popularly known as the devil-fish, and found in the tropical waters of Mexico, Florida, and southern California. Imagine a monster many feet across the back, having powerful flaps or wings with which he drives himself furiously through the water, or vaults high in the air, and possessing such strength that he will drag a boat with a couple of men in it for twenty miles at a racehorse speed before becoming exhausted, and you have an idea of this remarkable fish.

The one depicted in the illustration was harpooned near Manzanillo, in Mexico, by a man who, after tiring it, gaffed it, tied it to his tug, and brought it into the harbor, where it was raised by a crane, and photographed. From tip to tip across it measured sixteen feet and ten feet from nose to tail, and about two feet through. It weighed over 2,000 pounds.

PEEPS AND THEIR FOSTER MOTHER

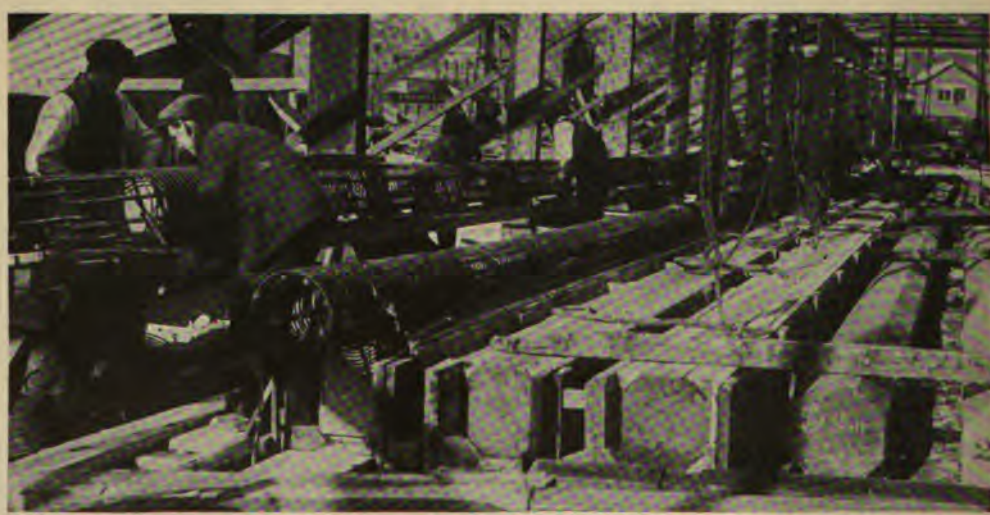
ONE incubator, one kind and intelligent terrier dog are the chief factors in the remarkable success that has come to a Phoenixville, Pa., man in his efforts as an amateur chicken breeder. The dog carefully and tenderly mothers the little chickens upon their leaving the incubator, and no hen could perform this task with greater success than has this dog, "Madge."

DOG ASSISTS HIS MASTER IN REARING CHICKENS HATCHED FROM AN INCUBATOR.



THIS IS A MODEL OF THE HARBOR OF HAMBURG, GERMANY, AS USED IN THE PUBLIC ENGINEERING SCHOOLS TO GIVE STUDENTS AN ADEQUATE AND DEFINITE KNOWLEDGE OF THE SHIPPING FACILITIES OF THIS FAMOUS PORT.

Educators of the present time are using all sorts of new methods to train the young in the practical things of the world. The Germans, with their usual thoroughness in all that pertains to education, are in the forefront in such things.



PREPARING IRON-CONCRETE PILES FOR THE NEW MARINE STATION, DOVER, ENGLAND.

The novel feature in connection with this station, to be erected on reclaimed land, is that it will stand on twelve hundred huge ferro-concrete piles. These are now being manufactured on the site, and range to seventy-five feet in length with seventeen inches diameter. They will be driven down into the chalk. Delay in waiting for the settlement of the foundations will thus be avoided. Piles will be sunk within the next year.

Next Month's Features—See Next Page

Technical World Magazine

HENRY M. HYDE, Editor

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Technical World Magazine should be on the news-stands on the 17th of the month preceding the date of issue. Patrons unable to get the magazine on the 17th will confer a favor by notifying the Circulation Manager. News-stand patrons should instruct their News-dealer to reserve their copy of Technical World, otherwise they are likely to find the magazine "sold out."

TERMS: $1.50 a year; 75 cents for six months; 15 cents a copy. Foreign postage, $1.00 additional; Canadian postage, 50 cents additional. Notice of change of address should be given thirty days in advance to avoid missing a number.

TECHNICAL WORLD COMPANY

Home Office: 58th St. and Drexel Avenue, Chicago Eastern Office: 1702 Flatiron Building, New York

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Entered at the Postoffice, Chicago, Ill., as second-class mail matter

TECHNICAL WORLD MAGAZINE FOR JULY

MOVING A RAILROAD SIX THOUSAND MILES

By

RENÉ BACHE

It is a bit unusual to pick up a few score of locomotives, with cars, tracks, etc., and ship them a quarter of the way around the globe. That's what the United States Government, however, is about to do. Mr. Bache presents all this in an article of unusual interest.

THIRTY THOUSAND DOLLARS A YEAR FROM TWELVE ACRES

By

STANLEY L. McMICHAEL

This is the record of a farmer near Cleveland, Ohio. Twelve thousand dollars of the thirty thousand goes into the bank as clear profit. That makes the call to the soil rather alluring, doesn't it? There's a way of achieving such success for others and Mr. McMichael tells us of that way.

WHEN THE STORM CENTERS GET LOST

By

WILLIAM THORNTON PROSSER

When the storm centers forget to pursue their proper paths, look out! Hot weather like that of last summer, cold weather like that of last winter, are the result. Lost storm centers are responsible, too, for one of the most remarkably mild winters Alaska has ever known—the winter of 1911-12. Mr. Prosser sets forth a new theory as to the cause of extraordinary and unexampled climatic changes.

LEGISLATURE CALLED TO FIGHT TINY FLY

By

CHARLTON LAWRENCE EDHOLM

A minute fly, smaller than the common house fly, was the cause of a special session of the California legislature to amend the law establishing strict quarantine against a pest that threatens our fruit industry. The entire session lasted less than half an hour, the measure passing the House in seven minutes and the Senate in five minutes by unanimous vote, but the enforcing of the law against the introduction of the Mediterranean fruit fly will mean unremitting watchfulness on the part of our quarantine officers for an indefinite number of years to come.

TECHNICAL WORLD MAGAZINE

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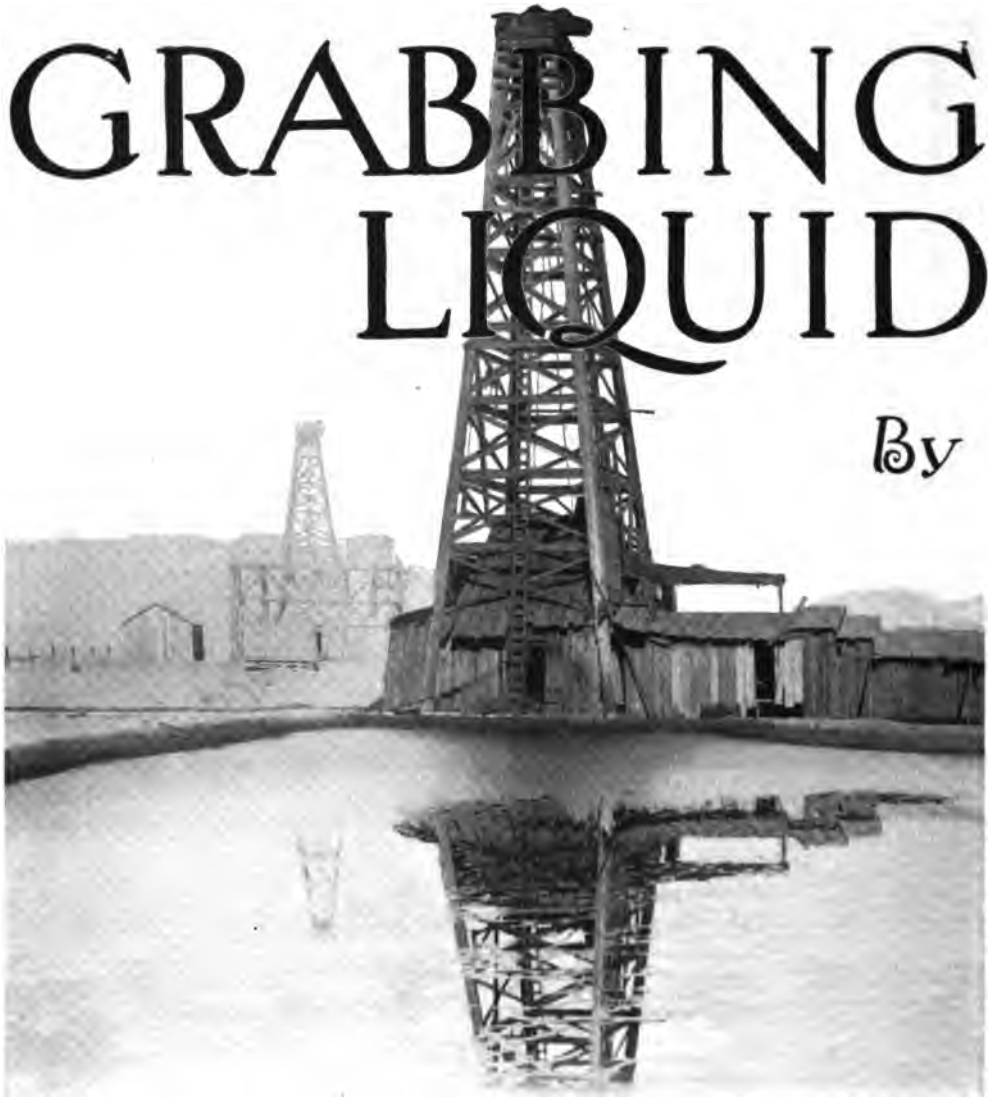
GRABBING LIQUID

By



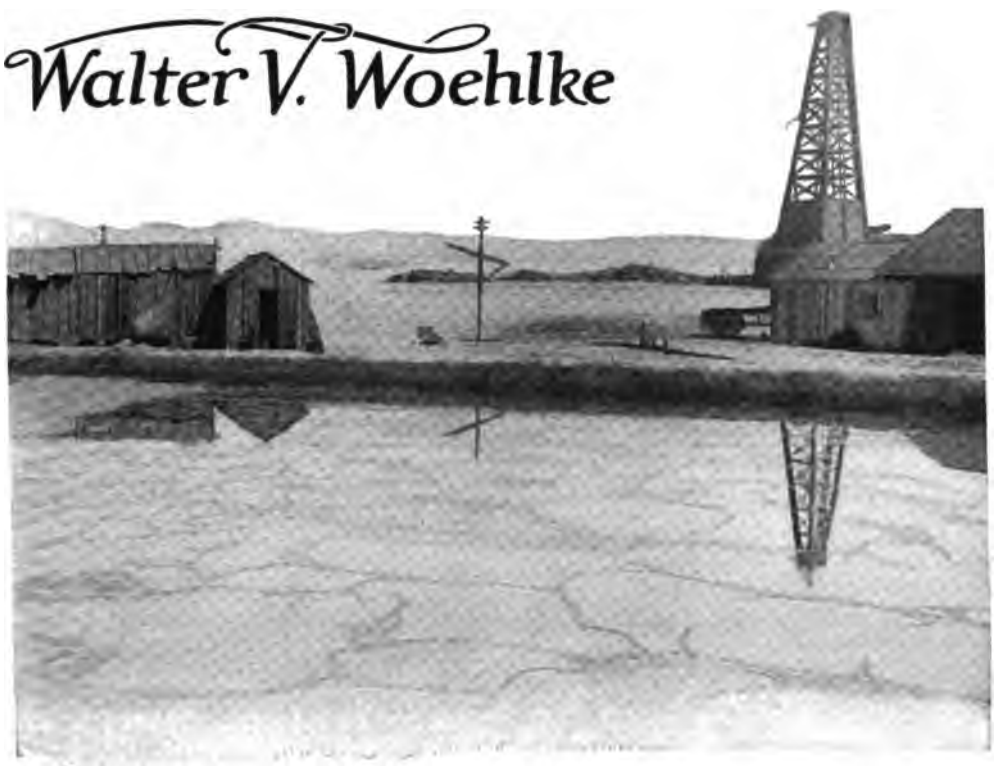
A POOL OF OIL

EARLY in the spring of 1900 when central California was in the throes of its first oil boom, two men drove over the barren, seared plains that swing down from the naked flanks of the Coast Range to the center of the San Joaquin Valley. It was hot, blistering hot, and the men were working hard. Locating section corners in a broken country with the thermometer at a hundred and twelve is not an agreeable task. Having spotted the corners the men proceeded through the sagebrush to the center of the section. With them they carried, from a bountiful supply, four posts and a number of blank forms. They filled out the forms with the date and a description of the land, and affixed thereto, besides their own scrawls, the names of six absentees and erected the four notices in the center, one on each quarter section. Thereafter they departed to repeat the operation.

These perspiring individuals were petroleum "prospectors." By erecting four location notices per section they imagined that they had rendered enough

THE WEST'S FUEL

Walter V. Woehlke



AT COALINGA, CAL.

service to the commonwealth to be rewarded with as many square miles of supposedly oil-bearing land as they could find vacant. Arduous was their labor. Should you happen to be in the halls of Congress at its next session, you may perhaps see briny tears coursing down the cheeks of fervid orators as they describe the hardships, the sufferings, the awful deprivations of those intrepid "prospectors," their heirs and assigns, who courageously decorated the howling wilderness with neat location notices. Just as the praises of the daring Alaskan coal prospector reverberated from the lofty dome of the Capitol, so the glorious achievements of the poor oil "prospector" of California will be lauded in stately periods, to the end that the spoils for which he rendered such valiant services may be saved for him, his heirs and assigns, principally for the last-named parties.

Let us trace the history of one of these sections located twelve years ago. In what is now the Midway field with its score of gushers the "prospectors" selected two square miles, Sections 26 and

An Oil Locator's Shack in the California Desert.

Under Pressure of the Natural Gas the Oil Bursts Forth in a Torrent.

24. Upon these sagebrush areas they erected their notices and immediately hunted for a buyer. One Jameson was willing to acquire what rights the locators might have in the land. He offered two dollars an acre. On condition that he also take Section 24 at fifty cents an acre, the locators accepted his offer for the other square mile. They pocketed the reward of honest labor. Great service had they rendered the public by being the first to decorate the land with a location notice. For this service they received sixteen hundred dollars.

Not enough oil to fill a pint-bottle was visible on the land. The "prospectors" simply guessed that petroleum might be somewhere beneath the surface. They did nothing to find or lift the oil. They were paid to get off. For the labor of removing themselves the pay was not bad, but the land was dirt cheap at the price. Neither did the second claimant do more than encumber the land with his presence. He, too, got off, for fifteen dollars an acre. His pay for removing himself was better.

The third set of claimants organized the Mount Diablo Oil Company. They leased a portion of the land to someone willing to do real work, willing to spend his money in an effort to find oil and bring it to the surface. The lessee struck oil, whereupon others rushed in to lease and drill the balance of the section. For its services in negotiating the leases, for its assistance in proving the presence of oil, the third set of claimants two years after the drilling of the first well received a monthly royalty of eight thousand barrels worth four thousand dollars at the prices then prevailing. One of the operating companies, from a partially developed quarter section, was paying dividends on a capitalization of half a million, notwithstanding the royalty it had to pay. The entire section, so it is reported, was sold to a British syndicate for a million and a half. Ultimately the Britishers hoped to receive

thirty per cent. dividends from the royalties.

You and I and all the other parts of the prodigal public sold that land for just enough to pay the transfer expenses.

Section 24, sold by us on the same terms, is today controlled by Standard Oil and the Santa Fe.

Two miles north of these sections lies a tract of eighty acres which, after passing through various hands, always at a profit, was acquired by one Dyer on a thirty-day option. The price was to be twenty-eight thousand dollars. Twenty-four hours later the Santa Fe bought the land for forty thousand dollars. Dyer made twelve thousand dollars on the deal in a day.

You and I and all the other part owners were satisfied with two hundred dollars.

Part of the land which now is the Kern River field, the oldest oil district in the San Joaquin Valley, belonged to the government. The largest portion of the remainder was patented to the Southern Pacific. When oil was discovered on this land in 1899, the railway, like the government, played the part of the fool without foresight. Because it had small faith in the future of the oil industry, because it did not recognize the economic value of the new fuel source, the Southern Pacific joyously made use of the oil boom to dispose of many sections for two dollars and a half an acre. In 1900 J. J. Mack and J. M. Keith bought from the railroad some eight hundred acres for two thousand dollars. The two companies organized to drill on the land have paid three million dollars in dividends since then, and the land is still producing two million barrels of oil a year, the Southern Pacific buying the output for use on its engines, just as the government is purchasing more than a million barrels a year, paying market price for oil that is pumped out of land given away with a free and liberal hand.

Here the analogy ceases. Though the Southern Pacific acted the part of a fool without foresight for a year or two, it soon ended the practice of giving away land worth five thousand dollars an acre. The government, on the contrary, continued to hand out its oil land to all comers. In Oklahoma the Interior Department erected a hog-tight fence around the oil land belonging to its wards, the Indians; in California the same Department allowed the speculators to help themselves for ten years. At the end of the decade, after incessant conservation preachments, after the scramble for the land had degenerated into a free-for-all fight in which the strongest and wealthiest, by brute force, were taking away the claims of the weak, the Interior Department at last awoke. But it did not put up a hog-tight fence. It only waved its arms menacingly and shouted: "Shoo! Shoo! Get out of there!"

Did the grabbers mind the shooing? Did they pull up their location stakes and depart?

POSSESSION IS A VITAL POINT IN SUCCESSFULLY HOLDING DOWN A CLAIM.
A few boards are thrown together in the form of a cabin and are loaded onto a wagon to be hauled out to a claim and set up as a home.

OIL TERRITORY UPON WHICH ASSESSMENT WORK HAS BEEN DONE.
This work consists in the installation of drilling apparatus.

They did not. Acting upon the advice of eminent attorneys, they placed the end of the thumb to the tip of the nose and wriggled the fingers derisively.

Once again the Interior Department pronounced its threatening "Shoo!" with the same result. That was nine months after the first warning. Having thus performed its duty, it centered its attention upon Alaska's coal, guarding with holy zeal that which no one was taking. Down in the San Joaquin Valley oil was being pumped illegally out of public land day and night. To this day it is being pumped out of land withdrawn from entry, but no steps have been taken to end the theft of public property.

Since settlement began the San Joaquin Valley has been the scene of grabbing operations on an impressive scale. It was here that Henry Miller, the German butcher—it was his boast that he could drive cattle from the Canadian to the Mexican line and water them on his own land every night—acquired a kingdom of 330,000 acres by various methods. It was here that a boat on wheels was dragged over many sections that the claimant might not perjure himself when he swore, in his application for patent, that he had traveled all over the "swamp" in a canoe before "reclaiming" the land. In this broad valley Haggin and Tevis acquired holdings of nearly half a million acres in one county. In this valley, through the efforts of the land barons, the insidious doctrine of riparian rights was foisted upon California, a doctrine which enables the great land owners to monopolize the flow of the streams without making a really beneficial use of the water. Here again, in the Sierra Nevada bounding the valley on the east, power corporations have pre-empted water power sites and water rights capable of producing two million horsepower, holding the rights and sites against the time when the growth of the valley below will make the development of current highly profitable.

In this sanctuary of the grabber the most important supply of fuel in the Far West was discovered. Before that discovery coal, imported from distant fields, retailed at fourteen dollars a ton in California. Coal fuel cost the railroads an average of seven dollars a ton. Every industry was handicapped by excessive

A DWELLING LITERALLY "DROPPED DOWN" ON THE PLAINS.

fuel expenses. More than gold, oil stimulated development along all lines of human activity. It is estimated that petroleum reduced the fuel expenses of the Southern Pacific alone by eighteen million dollars a year. Oil became a necessity, a treasure. And to lift this treasure the placer claim was used.

For many years the placer claim was the handiest tool with which to carve large and juicy slices out of the public domain. It covered every form of mineral deposit except veins and lodes of ore between walls of rock. It was elastic. With a little pull it could be stretched to cover standing timber, water power sites, water rights. And Congress stretched it to cover petroleum land.

What kind of a critter is this placer claim?

In its commonest form it is a rectangular piece of land containing some form of mineral, the land being claimed by the discoverer of its valuable contents. The law gives him this land provided he goes to work and digs, thus enriching the nation's store of wealth. No individual can claim more than twenty acres—at a time, but the law does not prevent him from claiming as many twenty-acre units as he can find vacant. To show his good faith, he must expend labor or improvements to the amount of a hundred dollars upon each twenty-acre unit every year for five years. Thereafter the land is patented to him.

To give the prospector a chance at more land with less expense, the joint claim was invented. The joint claim enables eight persons to pool their holdings, to take up a hundred and sixty acres and make all improvements on one twenty-acre tract. In effect, the joint claim increased the individual's grabbing capacity eightfold. With the aid of seven dummies who lent their names simply as an accommodation, expecting similar courtesies in return, one prospector could legally swallow an unlimited number of quarter sections instead of slowly and

HOW AN OIL CLAIM IS PROTECTED.

laboriously filing on twenty-acre claims. Thus, with no more expense, he could hold eight claims while doing work on but one. By means of this joint placer claim private parties, in quarter-section bites, devoured practically every acre of potential oil land in California. They would be peacefully digesting the meal by this time, not a foot of oil land would be left in the hands of the public if it were not for the ancient, unshakable fact that the bear refuses to part with his hide before he is found and killed.

Possession of any mineral claim rests upon the *discovery* of mineral. No rights of any kind are acquired prior to a discovery. No one is entitled to the proffered reward by pointing out a haystack as the locus of the lost diamond. The California oil "prospectors" squatted upon the haystack, did nothing and asked tribute of those willing to search for the jewel. They pre-empted square mile after square mile of public land presumably containing oil, but they furnished no proof of its presence. Most of them were willing to let the other fellow sink his money into a well. Drilling in Cali-

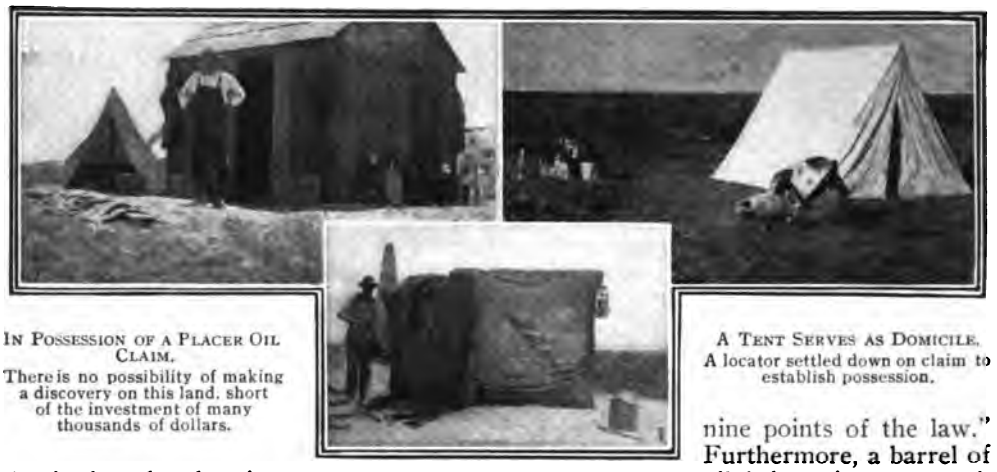
PART OF A MILLION-AND-A-
This was originally

fornia is expensive. Few wells cost less than $10,000; many holes swallowed five, ten times that amount. And money for drilling on wild-cat territory was scarce while oil was bringing but fifteen or twenty cents a barrel, less than the price of drinking water that had to be shipped forty miles into the parched sagebrush.

So long as the price of oil was low and the demand small, desultory assessment work sufficed to protect the holdings of men hanging on to wild-cat land without actually drilling. But when oil went up, when the demand for the new fuel spread and caught up with the supply, new "prospectors" calmly marched upon the silent, lifeless claims, kicked down the old location notices and erected their own. The one had as good a right to the land as the other. Actual, uninterrupted drilling leading to a discovery was the only legal method of obtaining title. Whoever struck oil first, his was the prize.

Capital, smelling big profits, began to buy out locators or bully them off their claims. Organized raids began. Gunmen were imported by the score, both to guard the land grabbed by their employers and to chase the small fry off the land wanted by the big operators. Rival corporations, backing different sets of locators, tore down each others' rigs and cabins, started wells on the same land and drilled day and night in an effort to land the bit in the oil sand first, thus gaining possession of the valuable quarter section. Gun-toting became epi-

HALF DOLLAR PROPERTY.
obtained by "locating" it.



IN POSSESSION OF A PLACER OIL CLAIM.
There is no possibility of making a discovery on this land, short of the investment of many thousands of dollars.

DWELLING MADE OF BOARDS AND SACKING.

A TENT SERVES AS DOMICILE.
A locator settled down on claim to establish possession.

demic, but the shooting-irons were but a bluff. The checkbook was mightier than the sixshooter. Most of the controversies over land that belonged to neither party ended in compromise and silent division.

During the height of the noisy clamor, in September, 1909, the government commanded that the bone of contention be taken away from the snarling pack. It issued an order withdrawing from entry every supposedly oil-bearing acre, including nearly half a million acres patented to the Southern Pacific.

That action should have ended the fighting and grabbing, but it didn't. By advice of counsel, the operators continued to hold their undeveloped claims and to begin drilling on them. Eminent legal lights maintained that the public had no right to cease giving away its property. Even if that specious plea should be overruled, so the grabbers reasoned, it is the time-honored policy of the Land Office to worship the doctrine that "possession is nine points of the law." Furthermore, a barrel of oil brings just as much money whether the land from which it was taken belongs to the operator or to the public. For these reasons the withdrawal order of 1909 protected the public's oil as effectively as the late tariff revision safeguarded the consumer's purse.

The *public* gained nothing by the measure. Mark, however, with what speed and precision the congressional wheels revolved to relieve endangered *private* interests.

The executive order unconditionally withdrew from entry every acre not yet patented to claimants. On many claims locators or their lessees were engaged in drilling. They had spent their money, but they had not yet struck oil. By the terms of the order men owning incomplete wells on withdrawn land would lose their investment. So they appealed to Congress for succor. It was granted promptly, very promptly. A bill was passed confirming the rights of those who were caught by the withdrawal with incom-

OIL FLOWING LIKE WATER THROUGH A DITCH.

plete wells. By-and-by scores of grabbers will make affidavit that they were thus caught when the order was issued, and that therefor they are entitled to patent.

Rapid action was the result of private parties' plea; no finger was lifted on behalf of the public.

Once more the speculators loudly called upon Congress to help them out of a hole. Some of the speculators joining in the appeal were actively engaged in rifling the public's pockets, but nevertheless Congress valiantly came to their rescue in this wise:

About a year and a half ago the Interior Department, in the Yard case arising in Alaska, promulgated a new placer-

A HUGE RESERVOIR AT BAKERSFIELD, CAL.

claim rule. It decided that, though eight men might jointly concentrate development work upon twenty acres only, patent to a quarter section would be issued to the original locators only. In other words, the Department decided to put a stop to the practice of gambling with the public's property. Unless the eight original locators staid on their claims and did their own digging, no patent would be issued for more than twenty acres. If the locators simply stuck up a notice and immediately assigned their interest in the quarter section, having rendered no service to anyone except to squeeze tribute out of the buyer, the transfer was valid only as to the twenty acres upon which improvements were made.

Immediately after this decision a committee of wealthy operators rushed from California to Washington, bathed in cold perspiration. At the hearing it appeared that the "hardy, courageous prospector" did not, as had been described so feelingly, so touchingly, "develop the country's mineral resources in the sweat of his rugged brow." Rather, it seemed that this individual had been in the habit of plastering the oil country with his location notices, doing nothing except to transfer the land to the corporations which began to drill when it suited their convenience. Mayhap he was sent out by these corporations and paid by the day for his "prospecting." Be that as it may, it appeared that many of the wealthiest corporations had acquired thousands of public acres from these do-nothing "prospectors." Unless they were helped out of the hole, the corporations would lose seven-eighths of the land thus acquired.

Of course their prayer was answered. Congress lifted them up, comforted and blessed them. Remedial legislation was passed at once, confirming them in possession. But nothing was done to stop the pleaders from pumping oil out of public land that did not belong to them. They won. You and I continued to lose.

In July, 1910, a second executive order was issued once more withdrawing the oil land from entry. Recently the California Conservation Commission, having vainly applied to the Interior Department for information, sent an expert into one of the fields to see whether this order had been obeyed.

The expert found that one millionaire operator was holding over six thousand acres of withdrawn land. At the time of the withdrawal order he had wells on three quarter-sections. By the terms of the remedial act he was entitled to four hundred and eighty acres. He held on to ten square miles.

GAS AND OIL SPOUTING UP.

Operators would give no information; foremen and drillers were instructed to answer no questions. Despite these handicaps the investigator found that numerous wells had been drilled on withdrawn land after the locators had been ordered off. He found wells, started on public land long after the second withdrawal order, which were producing large quantities of oil.

This superficial investigation covered only a small part of the territory. How many square miles of valuable land have thus been wrongfully taken, how many thousand barrels are being pumped daily from this area, these data can be ascertained only through the agents of the Interior Department. The California commission has no jurisdiction over the public domain. So far the Department has made no move to gather this information or to act upon it.

The Interior Department, however, is preparing to bring suit against the Southern Pacific for the recovery of more than 400,000 acres of oil land granted the railroad forty-five years ago. When the grant was made, Congress expressly reserved from its provisions all mineral land. By far the largest part of the land was patented to the railroad long before the presence of oil beneath the parched surface was suspected. Approximately one-third of the total, 150,000 acres of proven oil land, the cream of the holdings, have passed out of the carrier's hands by sale or lease. The balance of the Southern Pacific lands has been relocated to the last acre by individuals who are anxiously awaiting the outcome of the government's promised suit to cancel the railroad's patents.

If this suit is successful, if the oil land is recovered from the transportation company, what will the Interior Department do with the adverse claimants, the present occupants and squatters? Is the railroad land to be turned over without consideration to the men now waiting eagerly to pounce upon it? Is the government to take from one grabber and give to the other, with the public holding the bag and footing the bills?

What is the Department going to do with the operators now pumping the public's oil out of withdrawn land? On what terms will this land be restored to entry?

According to the Geologic Survey, oil operators in the United States own seven hundred thousand acres in fee. They

lease—usually on the basis of a royalty and a cash bonus—over eight million acres of land. Yet the California operators, at the time of the withdrawal, declared vehemently that the exaction of a royalty by the government would retard the industrial growth of the Pacific Coast and severely handicap the oil business. They have changed their minds since. They have seen the handwriting on the wall. They now realize that the good old days of free and unlimited grab are past, gone forever. Though it hurts, they are now willing to pay a royalty. They are now hatching out a bill introducing the leasing system to public oil land. They want Congress to pass this bill. It provides for a royalty of *five per cent!*

They take nineteen barrels; the public gets one. That is the oil men's idea of a fair division with the government. When they divide with private owners they open their purses and pay a cash bonus; thereafter they are satisfied with four or five barrels to the owner's one. Is there a single sound reason why the public should part with its oil at one-fourth the price paid private owners?

With a production of nearly eighty million barrels a year, the equivalent of twenty million tons of coal, California's oil fields have become the richest petroleum territory in the world. Though the cream has been skimmed off the proven area for private benefit, no man knows the extent of the oil deposits as yet undiscovered beneath the vast surface still owned by the people. Who shall control this most important source of the West's fuel?

Though he owns oil land galore in the world's richest petroleum belt, Uncle Sam is paying out your money and mine for millions of barrels of oil with which to dig the Panama Canal. Uncle Sam buys oil for his fleet of transports on the Pacific. Uncle Sam has an aggregation of war vessels consuming more oil fuel every year. For the boilers of his public buildings in the Southwest Uncle Sam buys oil. Uncle Sam already is operating one railroad with oil fuel. By-and-by Uncle Sam will operate more than one railroad; by-and-by Uncle Sam will need very large quantities of crude oil, the most efficient, economical fuel in the West, Alaska's coal not excepted. Uncle Sam owns large bodies of land containing this fuel. Will he continue to give away this land and pay out the public's money for oil fuel as heretofore, or will he at last wake up and make some provision for the future? Will he continue in his ancient role of fool without foresight, or will he resist the pressure of the grabbing interests and provide for coming needs?

Congress and the Interior Department will ultimately have to answer these questions.

A JUNE EVENING.

HOW THE GATUN LOCKS COMPARE IN SIZE WITH A SIX-STORY BUILDING.

THE CONQUEST OF THE ISTHMUS

By

HENRY M. HYDE

THE most tremendous work ever undertaken by men is fast approaching completion at Panama.

The French spent ten years in trying to dig a sea-level ditch ninety to one hundred and sixty feet in width and less than thirty feet in depth. When the company went into the hands of a receiver in 1889, less than one-third of the necessary work had been done.

The United States government, in little more than six years, full working time, will throw open to the world a great waterway three hundred to a thousand feet in width and everywhere more than forty feet in depth.

The French wasted more than $200,000,000. The Americans will spend about $375,000,000 in all the work connected with the construction and completion of the Canal.

During the French regime the Isthmus was a pest house. To be sent out to work on the canal was almost equivalent to a death sentence. In such a situation graft and corruption were natural. Chiefly men willing to take desperate chances for big stakes were attracted. One of the French importations to the Isthmus was a cargo of snow-shovels.

The Canal will be—is—a triumph of American engineering efficiency. But it is more than that. It is a permanent monument to the memory of Dr. Walter Reed, Dr. James Carroll and Dr. Jesse

THE TORO POINT BREAKWATER AS IT APPEARS FROM THE TOP OF TORO LIGHTHOUSE, ON THE CARIBBEAN SEA.

REAR TOWER OF THE LIGHTING AND BUOYING CANAL.
This is at the Pacific entrance to the Canal.

W. Lazear—three names with which the general public has all too little acquaintance.

The greatest—the one irresistible—enemy which the French had to face was yellow fever. Reed, Carroll and Lazear proved that yellow fever was transmitted and spread by the mosquito and in no other way. Lazear died in Cuba during the first experiments as a result of allowing himself to be bitten by an infected mosquito. Major Carroll, partially recovering, lived long enough to see the theory finally demonstrated and the yellow jack brought under control.

By exterminating mosquitoes, yellow fever has been stamped out on the Isthmus. By other sanitary measures, carried out on a tremendous scale, the death rate in the former plague spot has been brought down to a level with that in the most healthful of American cities. Back of the wonderful display of American engineering skill lies an equal great display of American sanitation. Back of that is the self-sacrifice of Reed and Lazear and their many fellows.

The whole thing is the greatest possible victory for the army of the United States. Army officers discovered that mosquitoes were the hosts of yellow fever and died on the field of duty. Army officers made human life possible on the Isthmus. Army officers are splendidly carrying on the building of the Canal.

The French—and they are not to be blamed for the universal ignorance of the facts—built great hospitals and stood the legs of the beds of the patients in little bowls of water to stop the depredations of ants and other vermin. So that about the cot of every yellow fever victim were four ideal breeding places for future generations of yellow fever carriers.

Present conditions on the Canal Zone

THE BREAKWATER AT CRISTOBAL, NEAR COLON.

are the best possible illustration of what science—backed by unlimited money—can do to make even the worst plague spot a healthful place for human residence. The population of the Zone is chiefly made up of a shifting, careless army of thirty thousand West Indian negroes, whose ideas of personal sanitation are worse than primitive. Yet even in dealing with such a population in the worst possible situation Dr. William Crawford Gorgas, Assistant Surgeon-General of the United States army, has kept the death rate down to a point as low as that of an American city.

But the cost!

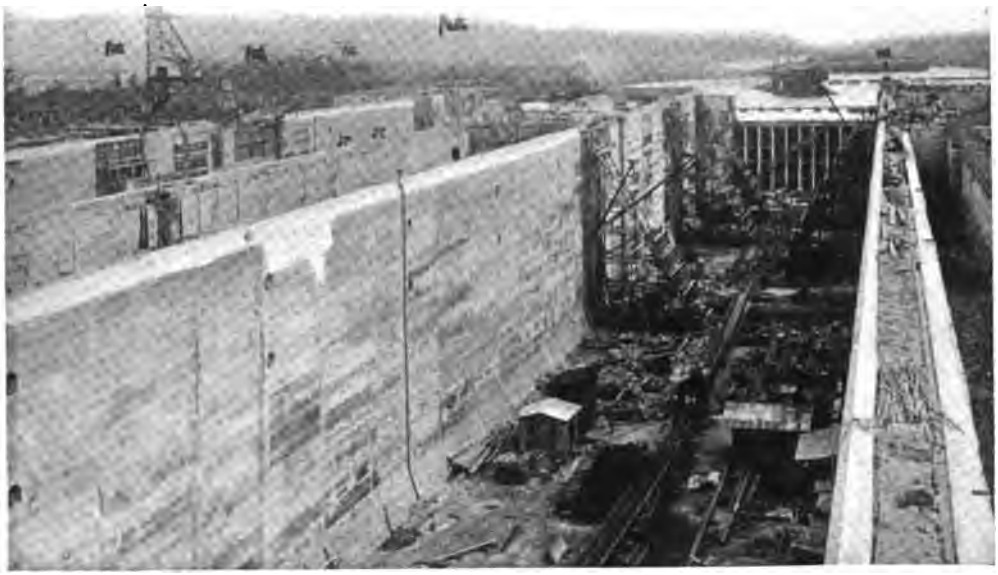
If the precautions taken on the Canal Zone were extended to the main territory of the United States the total cost would be between ten and twelve billion dollars a year. It would cost so much to keep the country healthful that nobody would have anything to live on.

On the engineering side, the army—represented by Colonel George Washington Goethals—has made an even more impressive showing.

From deep water on the Atlantic side to deep water on the Pacific the distance is fifty miles. Nearly four-fifths of the total distance, including the lock sites, has already been dug down to the proper

THE CANAL ZONE.

Note how the Pacific entrance to the Canal is east, the Atlantic entrance, west. South America is southeast of North America. Hence the west coast of the southern continent is almost due south of New York City.



PHOTO, UNDERWOOD & UNDERWOOD

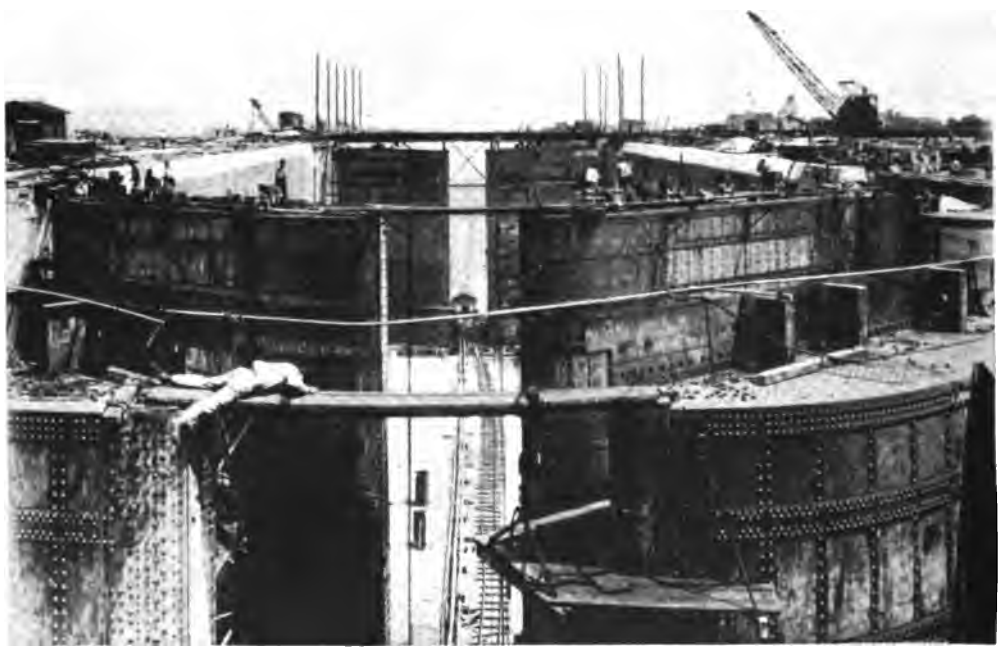
THE GREAT CANAL NEARING COMPLETION.
A view of the lower lock, at Gatun.

PHOTO, UNDERWOOD & UNDERWOOD, N. Y.

A VIEW OF THE GATUN SPILLWAY, LOOKING EAST.
On the left is shown the completed section under which is the operating tunnel.

LARGEST COMPLETED LOCK IN THE WORLD.
The Poe lock at Sault Ste. Marie, Michigan. It has a length of 800, a width of 100, feet.

depth, and of the thirteen miles remaining there is only about one-half on which much heavy



GATUN UPPER LOCKS, WEST CHAMBER, SHOWING THREE SETS OF GATES.
These locks are 1,000 feet long, 110 feet wide. When filled with water, they will lose something of this appearance of huge size as compared with the Poe lock above.

work remains to be done. The great task is nearing its end.

When Colonel Goethals was sent down to the Isthmus in 1907 the whole country was tired of the squabbles, delays and resignations which had hindered the

progress of the work. The army engineer was commanded to "make the dirt fly." In 1908, his first full year, he took out thirty-seven million yards of spoil,—half of what the French had accomplished in nine years. With that titanic accomplishment to look at the people heaved a sigh of relief and went on about their business. There was a man on the job at last.

WHERE FRENCH AND AMERICAN EXCAVATION WORK MEET.
The old French canal opens from the Atlantic—at the left.

THE OLD FRENCH AND NEW AMERICAN CANALS NEARLY READY TO BE UNITED.
This will be done by blowing up the dike that separates them.

Presently Goethals began to get the great machine to running smoothly and to show some of the economies which have excited the admiration of the engineering world. He has cut the cost of operating a steam shovel from 11.5 to 8.88 cents a cubic yard. Figure out what that means when nearly two hundred million yards of spoil are to be handled.

One of the greatest problems on the Canal has always been that of where to put the square miles of dirt and rock taken out of the big ditch. Army engineers give great credit to John F. Stevens, last of the civilian engineers, for the system of dump and spoil tracks which he laid out. But Colonel Goethals made a cut in cost of disposing of the spoil of from 18.54 cents to 15.22 a cubic yard, though, in the meantime, it had become necessary to haul the spoil twelve miles instead

WORKING MODEL OF THE GATUN LOCKS, DONE IN CEMENT.

of eight in order that the dump might be reached.

In dealing with the immediate problem of the present,—that is, the actual digging of the Canal—the future has been in no way overlooked. Everything about the Canal has been planned on a basis of absolute safety. To prevent the possibility of steamers' carrying away the gates of the great locks, it has been provided in the first place that they shall not make the passage under their own power. Instead they are towed by electric locomotives, one running ahead and another at the stern to hold the ship straight. The gates are protected by great chain barriers which are gradually paid out as the ship progresses. As an additional precaution each set of gates is built in duplicate and, finally, there are emergency steel gates which can be instantly lowered at any time. All the masonry and concrete work has been built with massive strength and nothing short of an earthquake could put the Canal out of business.

An interesting feature of the Canal and one which will prove attractive to ocean liners is the fact that for thirty-two miles ships making the passage will run in fresh water. This will clear off the barnacles and to that extent make docking unnecessary.

The public has read many sensational stories about the great slides and slips in the neighborhood of the Gatun Dam, yet few people realize that in the aggregate these slides amount to one hundred and forty-seven acres. But to this, as to all the other great problems which have arisen Colonel Gorgas and his corps of engineers have proven themselves entirely adequate.

Colonel Gorgas has just announced that within fifteen months he expects to send a ship through from the Atlantic to the Pacific. He grows anxious for the passage of legislation which will provide for the future successful running of the Canal. First of all he wants provision made for a permanent working force. It will take 2,500 men to properly manage the great ditch. This force, he thinks, should be made up of men picked from the great army now employed on its construction. To get the men desired becomes increasingly difficult, because the best of them, looking ahead, are taking other jobs as the Canal nears completion.

It is Colonel Gorgas' idea, also, that, once the work is done, the greater part of the Isthmus should be allowed to grow up again into a tropical jungle. He proposes the establishment of coaling and watering stations, a great laundry plant and other accommodations which will make the trip through the Canal attractive to ocean going ships.

Having given a unique example of wonderful efficiency, having practically completed a greatly enlarged work in less time and for less money than the $375,000,000 estimated cost, Colonel Gorgas feels a natural impatience at the procrastinating policy of Congress, which is at present devoting most of its energy to playing the great game of presidential politics.

TEACHING THE GIRL BEHIND THE COUNTER

"THERE is only one infallible rule for effectiveness in teaching—you must understand the people you are trying to instruct." Diana Hirschler's success is proof of the wisdom of her words. She believed that before the department store salesgirl could be taught to increase her efficiency it would be necessary for the prospective instructor to study the salesgirl's environment and get her point of view.

Miss Hirschler wanted to help the girl behind the counter. So she went into one of Boston's largest stores to organize its employees' welfare association. That was seven years ago. Since then she has outgrown the narrow scope of welfare work and has become interested in the larger problem of raising the standard of saleswomanship efficiency. She has studied the problem of the salesgirl from every angle, has worked with her and talked with her until she knows her, as she puts it, "from the ground up."

Today Miss Hirschler is recognized as the foremost authority on the most vital of all department store problems. She has lectured successfully in practically every large city from Maine to California. Sometimes she will deliver one lecture to a store's employees, again she will deliver a course of lectures covering a week, one, two, or three months. Just at present she is in the midst of a fruitful engagement begun in one of New York's stores over a year ago.

"Study characteristics," says Miss Hirschler to her pupils. "Learn to differentiate types and approach them accordingly. Cultivate an agreeable speaking voice and don't invite criticism and distract your customer's attention from the goods you are selling with elaborate coiffures, pungent perfumes, untidiness and jewelry. But, *above all* know your goods, study your stock and be prepared to tactfully meet any possible objection."

"DON'T DISTRACT YOUR CUSTOMER'S ATTENTION FROM THE GOODS WITH ELABORATE COIFFURES. PUNGENT PERFUMES, UNTIDINESS AND JEWELRY."

A GOVERNOR WHO DOES THINGS

A SHORT time ago Governor Benjamin Wade Hooper of Tennessee announced his intention of spending a couple of days and nights in the state penitentiary to observe for himself the conditions existing there.

Immediately his office was besieged by protesting friends. "Great heavens, Ben," they cried, "you don't mean to say you are going to lock yourself up with a lot of murderers, robbers, and niggers?"

"Sure," said Governor Hooper.

"But," his friends argued, "no other governor of this state ever did such a thing."

"Can't help that," said the governor. "It's the only way to get at the truth, boys. I'm going to sleep on a prison bunk, eat prison fare, and work a bit in the prison shops."

And he did. The first result of his visit

was the granting of some twenty pardons to deserving convicts. Another was an order abolishing stripes.

"They are a relic of barbarism," declared Governor Hooper. "A prison is an awful place, no matter how humane the management and conditions, and no good purpose is served in rubbing it in on the poor chaps who are unfortunate enough to land there. Heretofore we have thought of only two things in connection with the state prison. One was to get some one in the penitentiary, and the other to get him out. I want to help those fellows; I want to reform them and turn out better citizens."

The labor problem in the penitentiary and in the coal mines where convicts are employed faced him.

"Now this isn't right," said Governor Hooper. "These men work day after day, sometimes for years and years, and the state gets all the benefit. There ought to be a law that will give prisoners' dependent relatives some benefits from their work in prison. And I'm going to work for such a law."

At the age of five, Benjamin Wade Hooper, a stray waif, was picked up in the streets of Knoxville.

The little adopted street waif has made good. He is declared by men of all parties to be the biggest success as governor that Tennessee has had in many years.

In 1910 a split in the democratic party of Tennessee brought about his election as governor—the first republican governor in twenty-five years, in a state that goes, normally, democratic by forty thousand or more.

THE MIRACLE OF EXISTENCE IS MORE ALIVE AT IOWA UNIVERSITY THAN ANYWHERE ELSE.

"THE fact that you are not sharpened by the diverse life of the city accounts for some lack among you of a sense of humor, which might save you at times from the idea that you are created with special favor in a difficult world. You lack, further, ease of conversation, quickness of wit, versatility, and, in some degree, the constant gentility which is the pride of a Columbia boy."

These are the exact words which the thirty-three years-old president of the great Iowa state University said to the students in his inaugural address. And they liked it. They like "Prexy" John G. Bowman, too; like him better with every day that passes. He said something else to them—that those Iowans came with more seriousness of purpose than the average, that their minds were not dulled and surfeited with excitement, as at some other schools, that they still had the faculty of wonder alive and that was the most valuable asset which they could possess. Then he quoted George R. Parkin of the Rhodes Scholarship Trust as saying that the miracle of existence was more alive at the Iowa University than at any school he knew. He succeeds in telling the fiercest truths because he balances truth with truth. That frankness is fetching.

HE SUCCEEDS IN TELLING THE FIERCEST TRUTHS.

One reason he has that state university going so cheerfully is that he is an Iowan, brought up in the public schools of that commonwealth and at the same university.

There are some who claim he would not be so competent if he had not had experience in the great school of journalism. He served on papers in Davenport, Waterloo and Chicago, though there are no records of the unusual in his achievements in that line. He confesses to benefits received, however.

WAS A REPORTER IN CHICAGO.

But teaching was his predestined line of activity. He tasted the university life again as teacher, then studied at Columbia and taught there as professor. He is very well-informed on all matters pertaining to colleges.

"GOLD DUST BLEW INTO HER EYES - - SHE WENT TO A PHYSICIAN. WHO TOLD HER IT WAS DANGEROUS."

GOLD dust blew into the eyes of Miss Mary McEnerney of Chicago when she was a "bronze" girl in a book bindery. She went to a physician for treatment. He told her the powder was not only dangerous to the eyes, but that breathing it would have a bad effect on the lungs. So she set about to put the yellow stuff on the toboggan.

First she organized the bindery women into a union—of which she is the head—and then persuaded its members to taboo gold dust. Employers turned to the bindery men but they, too, had organized and decreed against its use. Out of the incident evolved the invention of gold ink and its introduction into the printing industry. Today bronze powder is used but little.

It required, energy, initiative and determination to accomplish this, but Miss McEnerney has all these requisite qualities in a generous degree. She realized how much improved methods and conditions of labor meant to those engaged in the bindery business, and letting nothing stand in her way she brought about the necessary reforms.

Since the formation of the union ten years ago Miss McEnerney has led the bindery girls to victory in three strikes. As a part of the organization she conducts a free employment agency and also furnishes jobs to many non-union girls. Thus, as may be seen, she acts in a broad and liberal spirit, above and beyond the immediate ends of the union she represents. Eventually she gets these non-union girls into the union. It is impossible for them to stay out after Miss McEnerney has brought the benefits to their attention. Thus she has an increasing membership that is loyal and steadfast to the cause of union labor. Miss McEnerney has never been opposed for her position as the only paid official of the Chicago Bindery Women.

A UNION OFFICER WHO ASSISTS NON-UNION WORKERS. This attitude wins over many to the organization.

SOME OF THESE MEN WHO WALK THE THEIR TRACKS HAVE BEEN IN SERVICE HALF LIVES.
A daylight trackman on the New York Central.

WATCHMEN OF THE TRACKS

By

BAILEY MILLARD

A SPECIAL train was humming along through the night over the wind-swept beach-side tracks of the Southern Pacific Company's coast line between San Francisco and Los Angeles. Trudging ahead of the train, between the rails and carefully inspecting every foot of the roadbed by the light of his lantern, went an humble employe of the company named Abe Jenkins. It was Abe's business to see that the track was in proper shape for the passage of trains. As he walked out upon a bridge he saw the dark figure of a man bob up from between the ties in the middle of the structure and run quickly toward the opposite side. Abe ran after the man, seized him and would have captured him but that another man appeared and beat him off. While these two were vanishing in the darkness Abe walked back to the middle of the bridge and there he found on a cross-piece under the ties a box with a rope protruding from it. He opened the box and in it found thirty-nine sticks of dynamite. The rope was a ten-foot fuse.

And now down the line and out upon the bridge shone the big electric headlight of the special. Abe stepped aside with the box in his hands, the train thundered out upon the bridge and whisked by him while he lifted his cap. And the reason why he lifted his cap was because he knew that in a car of that train, little dreaming of the plots of anarchists, or of any danger whatsoever, was the President of the United States.

It is not every trackwalker who has had the honor of saving the life of a President, or at least of rendering him so great a service, but, trudging up and down their lonely beats, many patrolmen of the rails have saved thousands and thousands of lives of lesser persons. You in your overheated Pullman berth, on a stormy winter night rarely, if ever, give a thought to the man walking the roadbed ahead of your train, facing the blizzard while his bright lantern gleams along the double row of rails, looking for loose platebolts, for high joints, for broken culverts, for track obstructions or whatever else might prove of danger in your swift flight through the darkness. But ahead of you there, safeguarding your way, the trackwalker tramps his cold, dismal beat, with wrench and oil can and lantern, with alert eye and ready hand to repair, if it is in his power, whatever damage has been

wrought by the elements or by the heavily grinding wheels, and, if he cannot repair it to set signals for the engineer and to summon the roadmaster and his gang.

At all seasons and at all hours these careful inspectors are on the job and the number of disasters they avert in the course of a long term of years is incalculable.

According to records that have been furnished to me by railroad officials all over the country, some of these watchmen of the tracks have been in actual service half of their lives. I have been to the pains of collecting and compiling some of these reports, and a few of them show a marvelous mileage to the credit of men who are walking the tracks.

Most conspicuous on the list is the name of Manuel K. Silva, a Portuguese employe of the Southern Pacific Company, whose amazing trackwalking record of 203,670 miles doubtless exceeds that of any other man in this particular branch of railway service in the United States. This record is the more wonderful because it has been made at a far higher altitude than that at which the other big-mileage trackwalkers have worked and under such other adverse conditions as have not beset the other high-record men in this line. In fact there is probably not another piece of main track in this country that presents so many difficulties and dangers, year in and year out, as that over which Silva has trudged for thirty-one years of the sixty-one which he has spent upon this planet.

HAS WALKED OVER ONE HUNDRED THOUSAND MILES.

Terence Reilly, oldest trackwalker of the New Haven System.

Near the bleak little highland station of Cisco, California, up-rears Red Mountain, one of the tall peaks of the Sierras. If you stand on the top of Red Mountain you can see almost the full length of the Central Pacific snowsheds by a mere turn of your head. These sheds, over forty miles in length, cover the sinuous track and the trains upon them as they toil up the long ascent to the summit. It is a raw, cold wind-swept, forbidding region, this skyland country of the Sierra snows. The traveler hates the snowsheds because they bar his view of the grand scenery that lies all about, he hates them for their darkness and more than all he hates them because of the smoke and the fumes from the locomotive which choke and stifle him, though these are not so noxious as formerly because of the substitution of oil for coal in steam making. But here at this heart-urging altitude, in all this cold and in these dark, smoky snowsheds, Manuel Silva has walked eighteen miles a day for over thirty-one years, and all this walking has been done in the night.

Think of it! Two hundred and three thousand, six hundred and seventy miles, a distance more than eight times around the world, walked under these hard and dismal conditions! Think of the physical endurance of a man who could keep this up night after night, seven days of the week for over thirty-one years, and during that whole, long barren period of

existence lose but a few days by sickness! There are heroes wearing the Victoria Cross who have done less; there are few who have done more than Silva, the Portuguese trackwalker.

Silva entered the Southern Pacific service as a section hand in 1879 and a year later became a snowshed watchman on the night shift and continued to walk the track and inspect the sheds up to a short time ago, when the company placed him on its pension list. During all those thirty-one years not a single complaint was entered against him and he was absent from duty only twice because of sickness. His beat was of three miles, over which he made three round trips every night. The hardships of the cold and dark were but a small part of his experience. Many a time has he fought desperate battles with tramps and several times has he fought still more desperate battles with fire. Avalanches have carried away whole sections of track, heavy snows have crushed in the sheds, mountain floods have torn away the roadbed, and always Silva has been there, lantern in hand ready to do his duty without complaint and without any great hope of reward.

Silva is now on a visit to sunny Portugal, but he is not content there. The charm of the high Sierras is ever upon him. He writes that he is going to return and spend the rest of his life in the neighborhood of Red Mountain. He is home-sick away from it.

EDGES OF GUARD RAILS MUST BE OILED AND ALL WEARING DOWN CAREFULLY NOTED.

TRACK-WALKER AND BOSS PUTTING IN NEW SPLICE BOLT AT SUBWAY STATION IN NEW YORK CITY.

But Silva's record, remarkable as it is, has been nearly equaled by that of another Pacific Coast trackwalker whose interesting story I shall now relate.

The other day there walked into the executive offices of the Northern Pacific Railway, in New York, a large man, whose old slouch hat covered a great shock of shaggy gray hair. He looked like a common laborer and yet he had gone to those offices to call upon the president of the road.

"Jim Rowan?" repeated President Elliot when the name of the visitor was announced. "Don't keep him waiting a moment. Show him right in. He is the most distinguished man in the service of the Northern Pacific."

Uncle Jim Rowan, as the railroad men call him, had just arrived in New York from Roza, in the State of Washington, where he had been walking track in the most dangerous part of Yakima Canyon for thirty years. A fortnight before his coming to New York Rowan had sent a letter to the district superintendent hinting that he would like to get off for a short vacation and go to Ireland and see the graves of his parents, and his sister. This request, together with the old man's history, was sent to operating headquarters at St. Paul and a few days later Uncle Jim was surprised to see the superintendent's special stop before the door of his little cabin in the canyon

and still more surprised when he was invited into the superintendent's car.

"You've been a faithful employe of this road for a good many years," said the superintendent, "and the company is not only going to let you have that vacation, but it's going to send you to Ireland at its own expense and bring you back again."

And so it was that, with a proud heart and two new flannel shirts in his valise, Uncle Jim went to New York. But on the way he found that his pass from Chicago to Buffalo had been dated by mistake a month back. The conductor, all unaware that Jim Rowan was the Northern Pacific's most distinguished employe, exacted cash fare, which was paid by the passenger. It was because of this mistake that Uncle Jim went to see President Elliott.

"If you've been walking the track for us for thirty years," said the President, "you've waited long enough for what's coming to you; and there'll be no red tape about the settlement of your claim. Here is the money." And he handed the trackwalker the amount he had been obliged to pay.

In his lively gratitude the old man almost broke the President's knuckles by his hearty handshake. "I'll bring ye back a blackthorn, Mr. Elliott," he promised as the president wished him Godspeed.

Uncle Jim Rowan figures that his mileage record as trackwalker is a little over 150,000, and the railway officials say that it must be at least 100,000 miles, but the nature of his service has varied and in the absence of actual data they hesitate to give an outside figure. For many years Uncle Jim lived in his lonely little cabin beside the railroad track in the Yakima Canyon near Roza. Here the road twists and turns so that an engineer can rarely see more than a quarter-mile ahead, and as huge boulders are likely at any moment to come tumbling down upon the track the section is one that must be carefully patrolled. This has been Uncle Jim's job, and he has performed it so faithfully that few accidents have occurred along his beat. In fact the most serious one was that which happened to himself ten years ago when an express train knocked him off the Yakima River bridge down into the bed of the canyon far below. Several of his bones were broken by the fall and for months the company's surgeons kept picking pebbles out of his back and shoulders. For a time it looked as though Uncle Jim had walked his last mile of track, but at last the doctors pulled him through and he went back to his little shack in the canyon, declaring that the company had treated him royally and that he would never forget its kindness.

WILLIAM YOUNG, WHOM THE RAILROADERS CALL "UNCLE BILLY." He says: "The fellows who figure make out I have walked 154,000 miles. They're off; I have done a lot more tramping than that."

"The N. P. has always done the square thing by me," he says, "and I never bothered 'em. Not once since I've been walking track have I put a bottle to my head. That's the best way to get along whether you work for a corporation or a man."

No complaint has ever been lodged against Uncle Jim. His record is clear. On his return from Ireland he will go back to his lonely post in the canyon, for, although he is sixty-seven years old, he is hardy as a mule, his sight is good and his eyes are shrewd and twinkling. That he is still able to give a good account of himself is shown by the fact that not long ago two burly tramps entered his cabin while he was asleep. Soon one of them ran away howling and the other was carried out on a stretcher.

George A. Burns, the oldest trackwalker in point of service on the Pennsylvania system, was credited by the officials of that company on January 1st with a record of 178,740 miles walked in

his thirty-five years of track patrol. Burns, whose hair and mustache are as yet unstreaked by gray, is fifty-eight years old. His eyes are keen, his face, roughened by weather, is ruddy and there is a hint of alertness in every swing of his short, lean frame.

Four times a day Trackwalker Burns journeys between Greensburg and County Home Junction on the southwest branch of the Pennsylvania Railway, a distance of 3.53 miles. Four times a day he walks his beat, carrying his hammer, wrench and oil can. He leaves home in the morning at 6:45, covering his beat and back again before noon. In the afternoon he again makes the trip, this time lighting the signal and switch lights that he has filled in the morning. Daily he walks the same stretch of track he has walked for over a third of a century.

"Oh, I get tired, you bet," he said with a shrug of his shoulders. Then he slid down into his chair with the air of a man who withal was content and added, "but no other work would suit me now."

In all his long service, Burns has had only one narrow escape from death or serious injury and this he characterizes merely as a "bump." The accident occurred in November of last year. While engaged in the placing of a splice bar he failed to hear the approach of an engine or its warning bell because of the blowing off of steam of another engine nearby, which deadened all other sounds. His right hip received the terrific impact and he was sent rolling down over a high embankment. This accident took him off duty for nine days. In all his years spent trackwalking Burns estimates that he has only been off duty for a month.

"It might be a month or a little over," he finally grudgingly admitted. "Take it altogether, it's very little more than a month."

In December, 1910, Burns was transferred from trackwalking to a position as watchman of a dangerous grade crossing, a busy section of Greensburg. But after a while the love of "keeping on the go" came over him so strongly that he pleaded for permission to go back to his old job and was allowed to do so.

The necessity of working week days and Sundays alike, of having only one warm cooked dinner a day and the great responsibility resting on his shoulders are not irksome to Trackwalker Burns. He says the life in the open and the pleasant acquaintance with people along his stretch of track, counteract the deadly monotony of walking the same ties, tightening the same bolts, riveting the same plates, seeing the same landscape and carrying the same load three hundred and sixty-five days in the year and an extra one in leap year.

SEVENTY-FIVE THOUSAND MILES TO HIS CREDIT.

Frank August, who holds the record on the Delaware and Lackawanna Railroad line.

Winter and summer for twenty-five years Terence Reilly, the oldest trackwalker in the employ of the New Haven system, has patrolled his beat of five and one-quarter miles once a day or ten and one-half miles for the round journey, and, together with extra walking, has rolled up a record of a little over 102,000 miles. The wind blows cold for six months of the year upon his beat, coming down from the Vermont and upper New York highlands and sweeping across Long Island Sound, but Reilly has stuck to his job and is proud to think that he is in the one-hundred-thousand-mile class of the men who walk the track.

Mr. Riley has discovered a number of bad breaks in his time and once near Waterville, Conn., found that some would-be train wreckers had wedged some brake-shoes in a switch. A passenger train was about due, but Riley was able to clear the track of the obstruction in time for the train to pass. He also did duty during the blizzard of March 12-15, 1888, in clearing the tracks of snow.

The trackwalker who has been longest in the service of the Delaware, Lackawanna and Western Railroad Company is Frank August, who entered the employ of the company in 1888 and is credited with a record of nearly 75,000 miles. Part of the time since that year he has been in section gangs, but has walked

SNOWSHED ON THE HIGH SIERRAS WHERE MANUEL SILVA WALKED EIGHTEEN MILES A DAY FOR THIRTY-ONE YEARS.

track for over sixteen years. August's beat is between Bergen Junction and Kingsland, N. J.

A great many railroads have no patrolmen with regular beats. Although all their tracks are patrolled every day, the officers of the New York Central told me that they had no trackwalkers with known records, for the reason that a man might be walking track one week and working in the section gang the next. This system of changing men about is pursued by many companies on the theory that a man is likely to become careless and inattentive if he passes over the same beat year in and year out. Some men are so constituted that the monotony of this sort of work results in a superficial examination of the track they are walking and this is fatal to effective inspection. Stevenson says Nature sets a brand upon the face of the man who is much alone, and Spencer declares that monotony of any kind is unfavorable to human life and particularly to mentality. Such being the case it is small wonder that so many railroad companies shift their trackwalkers about, giving them different beats and otherwise varying their work.

But beside Silva, Rowan, Burns and Reilly there are other railway patrolmen with big records. There is William Young of Franklyn, Pa., with 154,000 miles in 22 years and 8 months; Simon Owens, Washington, D. C., 135,626 miles in 23 years and 4 months; Dennis Watters of Norristown, Pa., 111,624 miles in

24 years; and Julius Hein of Edgewood, Md., who has covered 101,100 miles in 23 years and 3 months. These four men have walked over half a million miles.

William Young, whom the railroaders refer to as "Uncle Billy," went to work twenty-six years ago on the old Allegheny Valley Railroad and has been working there ever since. For most of this time he has been occupied in track-walking. The public refers to the line he works on as the "Valley road," but railroaders who know its dangers, call it the "Valley of the Shadow road." It is simply a succession of curves along the Allegheny River, and on one side is a high hill the base of which was cut away to make room for the roadbed. As a result landslides have always been a menace, and it is for them that track-walkers have to watch more than for broken rails.

When asked if he ever had any narrow escapes Uncle Billy broke into a laugh.

"Death has approached me in many forms," he said. "One night I was walking along without a thought of impending danger and suddenly an immense boulder dropped off a cliff above and struck three feet in front of me. I have had so many narrow escapes from being hit by trains that I can't recall them all. Once I got off the track so close to an express train that I could have touched the pilot with my hand. I remember one night I found a bad slide and I went up the track to flag a fast passenger train. There was a terrible snow storm and I couldn't see or hear the train. So I placed two torpedoes on the rail. A second after there was a 'bang,' 'bang,' and I jumped. The train had come without my hearing it, and the torpedoes were the only thing that saved it and incidentally myself. Many a train I have stopped near a slide or a broken rail and thought nothing of it. It was my business.

"I see," he continued, "that the fellows who figure make out that I have walked 154,000 miles. Well, they're off, for I have done a lot more tramping than that. I suppose they found the total by crediting me with the length of my beat each night I have worked. They take no credit of the hundreds of miles I have walked in retracing my steps. Why, one night I walked nearly fifty miles on a mile of track. It had been raining for several days and I suspected that any minute a part of a hillside would come down, maybe on me. Back and forth I walked, fearful almost that the jar of my foot would bring down the avalanche. But it didn't come, at least not that night. Besides these extra steps I walk two miles a day to get to my home."

TURNING IN AN ELECTRIC SIGNAL ON THE SUBWAY IN NEW YORK CITY.

Asked if he had ever been commended by his superiors, Uncle Billy said modestly that he once got a letter. He wouldn't tell what was in it. He admitted that not long ago he was called in on the carpet because a train in daylight had plunged off the track into the river. The superintendent thought a broken rail had been the cause and wanted to know why Uncle Billy hadn't seen it. The veteran trackwalker told the superintendent that fast running had caused the accident, and when the official verified the statement by a station agent he sent Uncle Billy home on the road's crack train, which made a special stop at the way station where he lives.

Uncle Billy says that when he is walking track his mind is constantly on his work. He realizes that any relaxation may result in the death of many people, and he draws a sigh of relief when he goes

off duty with the feeling that nothing has happened during his vigil.

"If I were a railroad magnate," he says, "I would have only intelligent men for trackwalkers. I wouldn't employ an ignorant foreigner. A trackwalker should be wideawake and a good thinker.

"Everybody blames things on the trackwalker. One night I was on my beat and an engineer who had run into a landslide reported that the trackwalker had stood on the bank and watched him go into the slide. I called him a liar, for I wasn't near the place and hadn't time to get there. Not long afterward the same engineer overspeeded and went into the river with his train and was killed. I honestly believe that if he had come out alive he would have blamed the accident on the trackwalker.

"During all my years of railroading I have never been sick a day, and never took more than two pills in my life. But my right ankle is simply wearing out. Those four days I missed in twenty-six years? Oh, yes, that was when I buried the woman."

Accidents to trackwalkers are frequent. Last year two were killed on the same Western line. Although the patrolmen on double tracks are supposed always to walk so coming train, reversing the rule on an emergency, sneaks up behind them and flings them into the ditch. On single-track roads the patrolman must be Mr. Facing-Both-Ways, for a special or a light engine of whose schedule he has no knowledge may run into him from around a curve ahead or attack him unfairly in the rear.

GEORGE A. BURNS, OF THE PENNSYLVANIA SYSTEM. Transferred from track-walking to watchman he pleaded to go back to his old job.

One of the most dangerous roads for the trackman is an underground line in a great city. On these roads scarcely a week passes without a fatality. In the New York subway, although trains are passing every five minutes and even oftener during the rush hours, there is plenty of time for a trackwalker or repairer to dodge in between the columns where he is perfectly safe, but sometimes men will stand as if staring at an approaching train, and in spite of warning signals, will permit themselves to be run down.

"There is a psychological reason for this," said Engineer Lockwood, manager of maintenance of the Interborough, to me. "It is that blank moment that comes to a man at times, during his waking hours. To railroaders that blank moment is such a recognized fact that they do not think it strange or unusual. I knew a civil engineer, a man who had been on and about railways all his life, who, forgetting where he was, deliberately stepped in front of a moving train and was instantly killed."

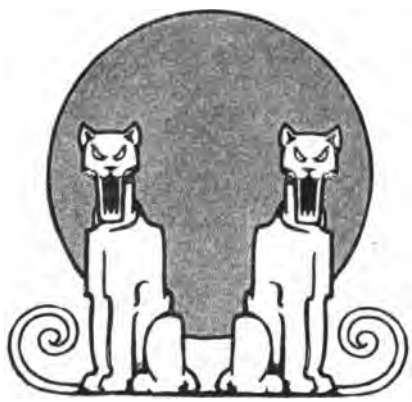
"JIM" ROWAN, OF THE NORTHERN PACIFIC, WHO WAS GIVEN A TRIP TO EUROPE IN RECOGNITION OF HIS MANY YEARS OF SERVICE.

In the New York subway trackwalkers work in ten hour shifts. They patrol their dark, draughty beats, lantern in hand, and when they discover any part of the track or accessories which they cannot readily repair they turn in a signal that summons the roadmaster and his gang. Nowadays few deaths either in subways, on elevated lines or other electric systems are caused by the highly charged third-rail, once considered such a menace to life. This rail is now covered and it is not so easy to step upon or otherwise to come in contact with it.

The patrolling of trolley tracks, particularly in bad weather, is now the practice on suburban lines with heavy traffic, but out in the rural districts, where cars are run infrequently, the motorman is often the only inspector of roadbed. Judging by the increase in trolley accidents this lack of proper inspection is little short of criminal, and there should be stringent laws requiring the employment of regular trackwalkers on all such lines.

The duties of trackwalkers have increased with the years and the improved systems of railroading. On big lines like the New York Central, the Pennsylvania and the Lackawanna track inspection has been reduced to an exact science. The patrolman registers in the tower at the end of his beat the hour and minute of his arrival, departs on his journey and registers in the tower at the other end. He carries a registering clock, by which his trips can be checked to the minute. His route usually covers about four miles, but is less than half this on stretches where special watchfulness is needed. Night or day the trackwalker must see that every frog, switch and signal is in good order. If a nearby tree looks dangerous, he must report, so that it can be chopped down. If an overhanging rock may become loose the trackwalker must know about it in time to avert a possible accident. Road crossings must be examined for danger to teams as well as to trains. Other things that demand his attention are out-lying water stations, overhead wires and even the cattle loose in the fields.

It is right that these veterans of the railway service should be pensioned or given free trips to Europe or wherever they may wish to go. In the first place it proves, what is so often denied, that there really is such a thing as official appreciation of long and faithful service, and it also proves how significant is the position of the trackwalker. In fact, since I have been studying this subject I have seriously questioned, when I have heard the name of this or that great man of the dollarocracy, whether his business, though highly esteemed of men, was half as important as that of the obscure and humble trackwalker.



WHERE YELLOW CONTRABAND IS SLIPPED ASHORE.
All the elements of melodrama—rocky coast, a dark night, a vessel without lights gliding shoreward.

COOLIES MAROONED ON ONE OF THE CORONADO ISLANDS WITHOUT FOOD OR WATER.
They had been abandoned by those "running the revenue." Immigration inspectors are shown in the background.

YELLOW CONTRABAND

By

CHARLTON LAWRENCE EDHOLM

ONE dark night last November a high power gasoline launch came stealthily in from the Pacific and entered Monterey Bay. The engine was muffled so that her progress was almost noiseless, nor was there the sound of a single voice aboard nor the faintest glimmer of light, not even the spark from a cigar end, and yet she carried twenty-five human beings, two white men and twenty-three coolies, the latter huddled closely and lying low. Avoiding the regular landing places the launch headed for a sandy beach with no habitation in sight and rested silent and motionless while a couple of small boats were put ashore. The first of these had barely shoved her nose into the sand when a sharp voice exclaimed, "Hands up, you are under arrest!" and half a dozen shadowy figures sprang up from their hiding place on the beach and the starlight glinted upon their leveled weapons. The other boat was so close behind that escape was impossible. The coolies lost their heads and began to shout and cackle in their high-keyed voices, but the two white men surrendered silently and sullenly. They knew that the game was up; the entire outfit, coolies, smugglers and launch, was in the hands of the Government.

A SMUGGLED CHINESE CAPTURED BY FEDERAL OFFICIALS.

Almost simultaneously with this capture of yellow contraband by the immigration officials, a hotel room was raided in Los Angeles and a dashing young woman was captured by the officers. She was discovered reading a novel and smoking a cigarette the while after the manner of the heroines of melodrama. The next morning the papers described her as the queen of the smugglers and she was booked on the police blotter

A SMUGGLED CHINESE COOLIE MADE TO RESEMBLE A JAP.

as having conspired to land Chinese illegally in the United States.

At the same time another alleged conspirator was taken in the toils, a swarthy Mexican, but one of the educated and resourceful type. He carried himself like one used to command and it was claimed that he had formerly been governor of Lower California.

How much all this sounds like a page from a picaresque novel! How much resemblance it bears to the stage setting of a

DEAD MAN'S ISLAND. SOUTHERN CALIFORNIA.
This is a convenient landing place for "yellow contraband."

melodrama, the moonless night, the deserted coast, the silent mysterious vessel, the swift action of the arrest with the steely glitter of leveled firearms. But it is all reality, part of the day's and night's work of the immigration inspectors on the Pacific Coast; a taciturn lot of young men, vigorous, alert and close-mouthed. Unfortunate indeed is the latter characteristic, for what a lot of rattling good

MANZANILLO, MEXICO.
One of the ports from which the smugglers set out with their human cargo.

THIS DESOLATE ISLAND IS USED AS A WAY STATION FOR SMUGGLERS.
Here several coolies were abandoned without supplies, and nearly perished.

stories these chaps could tell, if they only would!

But it is not their business to volunteer information for the benefit of story writers. Their duty is to guard our irregular coast line which extends with easy landing places for a distance of about six hundred miles between San Diego, near the Mexican Coast line and north to San Francisco and beyond. Here is played (and adventurous moves are being made

even while you read these words) a man-size game of "hide-and-seek," in which gold plays a part and Death often takes a hand.

The revenue cutter *Bear* and the swift launch *Orient* ply up and down the coast, keeping a sharp lookout for low-lying, smoke colored power boats, ostensibly mere fishing craft, but often smugglers of yellow contraband, the excluded Chinese, who are brought up from Ensenada and other Mexican ports to be shipped ashore in this land of their heart's desire.

Mexican desperadoes, smug Chinese merchants, white men of many nationalities, but all with the temperament of gamblers or soldiers of fortune, are regularly engaged in this game, wherein the chances are good and the stakes are high. Even negroes and Japanese have been known to try their hand at it, but they are exceptional cases.

There is no lack of capital behind the smuggling rings, and ready money is an essential for some of the moves; cash for equipping the power boats and schooners; property for those who must furnish bond when suspected Chinese are detained, and gold without stint for the lawyers who undertake their defense.

It is claimed that there are about fifty smuggling rings operating between El Paso and the Pacific Coast and between Tia Juana and San Francisco, and that no less than twenty vessels are constantly engaged in the traffic.

First the coolies are landed in Mexico, a matter of no difficulty as they are not excluded from that country. Those who are without means have no trouble in finding employment and immediately set about to save a couple of hundred dollars for their passage money into the United States, which, as a rule, must be paid in advance. When financially qualified they receive a course of instruction in a school, where a smattering of English is taught together with a few general bits of description to enable them to lie plausibly in case of capture by the immigration officials. For instance, they are given the names of certain streets and numbers in San Francisco's Chinatown where they presumably lived before the great fire, at which time their "chuck gees" were so unfortunately destroyed. These are the papers which certify that a Chinaman has a legal right to be in this country, and although it is possible to

A CAVE ON THE CALIFORNIA COAST WHERE SMUGGLED COOLIES WERE TEMPORARILY CONCEALED. The cave was on the shore where the high tide flowed, so that a skiff could be floated, and the coolies removed without detection.

CAMP IN ARIZONA CAVE NEAR THE MEXICAN LINE. In such underground places the Chinese hide by day, traveling by night.

ONE OF THE SMUGGLERS' LANDING PLACES IN SOUTHERN CALIFOPNIA.

supply some of the smuggled coolies with "chuck gees," formerly owned by celestials who have returned to China or died, yet there are not enough of these valuable documents to go around, so a little pigeon English and an apparent familiarity with San Francisco is very helpful in case of examination.

Although the Mexican government does not interfere with them in any way, yet there is always a mysterious and secret leave-taking from Ensenada or any other Mexican port of departure. The reason for this is that there is considerable danger of the immigration officials being "tipped off" by some volunteer who is desirous of earning the reward for such information. So the twenty-odd who are chosen for a given consignment slip away from town by twos and threes in the twilight and meet at some convenient and secluded spot. It may be a deserted beach or an obscure boat house, and one rendezvous is a certain cave in a seaside cliff into which, with favorable tide, the water runs high enough to float a skiff.

The Ghost, OF JACK LONDON'S "SEA-WOLF"—A CLOSE SECOND TO THE *Lou* AS A SMUGGLER.

Once at sea, swifter than almost any other craft on the waters, while the diminutive size of the hull, which hugs the water and is painted a shade of grey that is almost invisible, is also a factor that counts in their favor.

FISHERMAN HARBOR, SAN FRANCISCO.
These swift-going launches of the fishers are often utilized for carrying "yellow contraband."

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THE SCHOONER *Lou*, SAID TO BE THE OLDEST CRAFT ON THE PACIFIC COAST.
This boat is declared to have carried more opium and Chinese into the United States than all other vessels combined.

Sinister tales are afloat, and they seem to be well founded, of launches which have been pursued by the government vessels and which were known to carry a score or so of coolies. When overhauled, after a long chase, not a Chinaman was aboard, though unmistakable traces of them were found. There was no legal evidence in these cases to convict the crew of having thrown their living cargo into the sea, but that was the only solution of the mystery. The white

the Chinese are taking big chances but they know that the little power boats are

men were armed and courageous, the coolies timid and weaponless, and moreover they had paid their passage money in advance. The smugglers faced long terms of imprisonment if they were caught with the evidence, so why not destroy the evidence?

In one case the report was made public of a boat load of Chinese who were seen crowded into a skiff in the wake of a rapidly disappearing "fishing" launch. Before the pursuers could overtake it, however, the overweighted row boat was swamped and once more the evidence was destroyed.

On another occasion a small cargo consisting of ten coolies narrowly escaped a worse fate. Being in danger of capture from a government vessel, the captain of a small schooner ran close to the Coronado Islands, twenty miles off the coast of San Diego, and marooned his charges without water or food. Now the Coronados are without water, being rugged and uninhabited rocks jutting up from the ocean, and the only food obtainable is shell fish, the eggs of wild birds and such game as could be caught with the naked hands. It was by sheer good luck that they were discovered before death ended their sufferings. They had been in a famishing condition ten days, before a party of pleasure seekers from San Diego happened to notice a signal which they had hoisted, a tattered piece of sailcloth on a stick. It was too rough for the pleasure boat to attempt a landing, as the island is accessible only in fine weather, and then with a row boat, but provisions and water were bundled up in packages that would float and allowed to drift ashore to the abandoned coolies, who fought for them with the ferocity of despair. The following day the ten castaways were taken aboard by the *Orient*, but as the Coronados are Mexican territory, the victims of the smuggler's cruelty could not be sent back to China by the authorities. Instead of that, they were returned to the Mexican port from which they had sailed and probably by this time have managed to smuggle themselves into the United States by one of the numerous "blind trails."

Many stories are told of long, stern chases at sea, and of attempts, sometimes successful and sometimes in vain, to capture the smugglers by strategem. Some of the immigration officials have gone so far as to disguise themselves and make use of a launch such as is used by the fishermen of San Pedro. In this way they could keep watch about the islands around the coast with good chances of success, as many of the fishermen are friendly to the smugglers and willing to earn an occasional hundred or so by helping them out. Sometimes, too, when information as to a proposed landing is secured, an ambush is arranged and armed men are stationed to watch out for the grey painted launch without lights. One ambuscade like this had doubtful results. The immigration officials were in waiting on the bascule bridge at the entrance to Long Beach Harbor and when, in the darkness and fog, they descried the smuggler's craft they fired upon it after due warning. In spite of the fusillade, the launch took the chance and ran through the harbor entrance and disappeared in the lagoons. Shortly afterwards it reappeared and again sped past under a rain of shots. The officials said that no landing could have been made in that time, but several weeks afterwards a dozen pair of Chinese shoes were found in the mud near the harbor. The theory is that the coolies were met by friends who had brought them American footwear to correspond with their ready-made suits and cropped hair.

Even when smuggled coolies are caught in obscure cellars in Chinatown, the agents of the smugglers' ring do not necessarily lose. Even if the coolie has not paid his way in advance, there is a good prospect of the syndicate making its money just the same. The method of accomplishing this is ingenious enough: the Chinese laborer gives his promise or note to pay a certain amount upon being landed here, and by the Chinese code of honor no repudiation of contract is probable. Even if the coolie should be captured, he is bound to pay the two hundred dollars, or whatever the amount may be, and the matter is arranged thus: the prisoner is given expert legal services and his hearing before the court lengthened as much as possible and if he is ordered deported an appeal is taken on some technicality. Meanwhile he is

admitted to bail to the amount of a thousand dollars or so, and the sum is readily advanced by the wealthy members of the ring. It may be six months or even a year before the case is again brought before the court and meanwhile the smuggled coolie has been industriously tilling

SOME OF THE FISHER FOLK OF THESE COLONIES OCCASIONALLY TURN SMUGGLER.

A SMUGGLED COOLIE IS EASILY LOST IN THE CROWDS OF CHINATOWN.

TYPES OF OVERLAND SMUGGLERS.

SAN JUAN CAPISTRAN—A MISSION IN CALIFORNIA WHERE AN AUTO FILLED WITH OPIUM AND "YELLOW CONTRABAND" WAS WAYLAID BY REVENUE OFFICERS.

the soil or washing clothes or making fair wages at some other employment. From the amount which he saves, he is enabled to pay to the smuggler's syndicate the amount for which he gave his note, so that the dealers in this human contraband stand to win either way.

The methods of the guides who bring the coolies over the "blind trail" are as ingenious and unscrupulous as those of their seafaring brethren. The same dark stories drift into civilization of the bodies of slaughtered Chinese found in lonely mountain passes, who were thus disposed of when the danger of pursuit became imminent.

Mexicans are usually chosen as guides, as there are many to select from who have been born and bred among the southwestern ranges and who know every pass and canyon. The small bands of Chinese are attired as much as possible after the fashion of Mexican laborers, and the big straw sombreros that come well down over their faces would cause them to go unsuspected by the casual passerby. Not that

U. S. Revenue Cutter. *Bear*. That Patrols the California Coast on the Lookout for Smugglers.

they take any chances in meeting people, for they hide by day and travel by night, avoiding the well-known trails and being especially careful to leave no tracks. When they are forced to leave the hard ground to cross a dusty road the precaution is taken of laying a blanket on the ground over which they have passed. This is quickly raised at the four corners, and as it is flipped up the dust rises and settles again completely obliterating the tracks. Sometimes these bands are led into colonies of their fellow countrymen, which may be a ranch where a large number of coolies are employed or perhaps a Chinese quarter of one of the smaller towns. The efforts of the smugglers are directed to getting their charges safely into the Chinatown of one of the larger cities and there are several ingenious methods of sending them speedily out of the thinly settled districts and into the cities.

Power Launch. *Orient*. Used for Chasing Smugglers.

U. S. Revenue Cutter *McCulloch*. Which Assists in Suppressing the "Yellow Contraband" Traffic.

They have gone so far as to utilize the automobile for this purpose and only a short time ago a big touring car was stopped by the immigration officials with a tonneau full of contraband Chinese. The capture was effected at night and it required the persuasion of sawed off shot guns to bring the car to a stop. Very shrewdly the officers had stationed themselves in a narrow pass with a steep grade so that no escape was possible.

Another recent case in which the automobile was used for coolie smuggling was that of a well-known San Diego business man who was tempted by the large profits to risk his reputation and his liberty, breaking into the game as an outsider; just as the casual visitor to Monte Carlo is sometimes overcome by the sight of the apparently easy money and takes a chance on the impulse of the moment.

This man ran down to Tia Juana in his forty-horse-power car and picked up a Mexican, a coolie and about four thousand dollars worth of opium, the contraband, human and otherwise being deposited on the floor of the tonneau and covered with rugs. The return trip to San Diego was made in safety, but the contract called for delivery in the Los Angeles Chinatown, and by the time the automobile had left the southern city on

the Los Angeles road the immigration officials had been "tipped off" by one of the many observant spies. It was too late to set out in pursuit from San Diego but a telephone message was despatched to Elsinore, about half way between the two cities, and the officers stationed there were instructed to intercept the automobile. It was known that the amateur smuggler was not coming through that little town but was taking the coast road, so a couple of inspectors mounted their motorcycles and made a midnight ride across rugged country to the old Spanish mission of San Juan Capistrano. Here they waited in ambush in the shadows of the ruined adobe structure and presently the silence of the night was broken by the distant roar of an exhaust. The automobile was tearing along at full speed with the muffler cut out, trying at all hazards to make Los Angeles before daylight. The motorcycle men seized their guns and took up a position where they could command the road and as the searchlights of the automobile came in sight they shouted for it to halt. The driver of the car probably thought that he was being intercepted by "speed cops" and decided that the quickest way out of the difficulty was to stop and give his number which would result in nothing more serious than a fine of ten dollars or so for breaking the speed laws. But the Mexican had probably an inkling of the truth for as the car stopped he drew a revolver and shouted to his companion to go ahead. It was too late, however. At the flash of his weapon the officers sprang into the car, overpowered the Mexican and dragged him from the machine, disarming him in the struggle. The white man made no resistance; realizing that he had lost out in the desperate game he allowed the officers to throw back the rugs disclosing the crouching coolie and the tins of opium.

The ingenuity of the smugglers is shown by a system of introducing their charges into sealed freight cars without breaking the seal: the method is to use a cold chisel on certain bolts which hold the sliding door to the car. When these bolts are removed it is possible to pry open that end of the door farthest from the seal just about wide enough to admit a man with some squeezing. With the human cargo safely aboard, the door is slipped back into place and fresh bolts are inserted in the holes left by the original ones and the nuts are screwed to them by one of the Chinese inside. The car can then stand inspection by train men or suspicious immigration officials; the seal is undisturbed and all is apparently as it was. The train is made up, the cars pull into San Francisco or Los Angeles and by unscrewing the bolts from within the Chinese can escape.

Some odd cases recently came to light which indicated the connivance of negro porters and waiters in secreting Chinese on the passenger trains. Frightened coolies have been found cowering in linen closets, coolers and in the lavatory of an empty car. In fact they were so securely hidden in the latter instance that they would have been safely landed at their destination but for their curiosity regarding a certain mysterious push button. They kept pressing the button and in their deluded ignorance were rejoiced exceedingly at the faint tinkle that responded. At the outer end of the car, though, the faint tinkle was an imperious and persistent ringing and the conductor, who happened to pass through, sought for a reason. The porter's explanation was far from satisfactory but the sight which met the conductor's eyes when he opened the door was sufficiently enlightening; three yellow, grinning, "heathen Chinee" playing tricks with the electric bell. As there is a liberal reward, $350.00, for information that leads to the capture of yellow contraband, the worthy conductor felt that he had not investigated in vain.

As to the number of coolies arrested and deported, the Commissioner General of Immigration furnished the following figures to the author: Total arrests for fiscal year ending June 30th, 1910, 977. Deportations, 825. For the following year ending June 30th, 1911, arrests 669, deportations, 522. These figures are for the entire United States.

For southern California, the section of the country treated in the article, they are large in proportion: for 1911, arrests, 172; deportations, 135. For Arizona for 1911, arrests, 85; deportations, 74. Western Texas for 1911, arrests, 157; deportations, 168.

The CABIN IN THE WOODS

BY E. I. and M. H. PRATT

THE ARTIST'S LOFTY STUDIO.

"NO one builds log houses today," they told him, "your idea is impossible. You can't get the logs, and even if you were able to you couldn't get the men to build it."

But Adam Emory Allbright, the artist, having a picture in his mind of the little square log cabin of pioneer times, knew what he wanted and was determined to get it.

ADAM EMORY ALLBRIGHT, THE CHICAGO ARTIST WHO BUILT THE CABIN IN THE WOODS.

It would be an easy matter to reproduce the cabin, but what he desired was a log mansion, of the same construction, and its setting was to be deep in the woods, where the underbrush was thick, and everything that wished to grow would be left unmolested. Amongst the oaks and elms of Hubbard Woods, a north shore suburb of Chicago, the log house was to be built. Mr. Allbright planned the house himself without the assistance of an architect, and oversaw the building of it. Very few log houses of this type are to be found anywhere; the different parts were brought with considerable difficulty from various parts of the country. Its immense sixty foot logs of Norway pine came from the woods of northern Minnesota, and an old "northwoodsman" was found in Chicago to direct the hauling and handling of the six carloads from the freight depot to the building site. The builders and carpenters had to be men who understood construction with large logs, so "break water" men were hired,

whose work had been with pile driving, and who knew how to handle and spike the timbers.

All the woodwork inside and the floors and doors are built of solid oak, the doors being of craftsman style, stained to match the gray brown of the logs.

There are two stories on one side of the house, on the other the owner's studio runs up the entire height of the second story, and a full cement basement is underneath. The house measures forty-eight by eighty-four feet. One-half of the floor space is taken up in the living rooms for the painter, his wife and three boys. These comprise dining-room, library, kitchen, bed-chambers and servants' quarters. The studio and large living room or reception hall form the other half.

Many of the rooms have not yet been finished, and the owner expects it to be ten years yet before the house is complete to his satisfaction.

He did not want a "ready-made" home, but one that would grow with the family life, and be a part of that life and an expression of it. Little by little furniture is being built exactly in harmony with the spacious chambers and high ceilings, and various touches added here and there to accord with the artist's ideas of what the interior of a log house should be, just as the exterior is so perfectly a typification of the real log cabin.

At present willow furniture is used throughout, as it is light, easily carried about and cared for, and harmonizes well with the woodwork and walls.

A GLIMPSE OF TWO OF THE LIVING ROOMS.

In the studio is a huge fireplace, like autumn leaves in its soft, rich coloring. This is built of ordinary clinker brick which the owner procured from an old brickyard.

The big living room is fashioned in the same style as the studio, with log walls. The spaces between the logs are filled with split cordwood; after this chinking the interstices are calked with oakum. Inside and out this has been covered with concrete plaster mixture. All the other rooms except these two are to be lathed and plastered inside.

There is another fireplace here, of the same material, around which winds the low broad stairway of solid blocks of oak, which the owner had hewn in Indiana expressly for this purpose. Wax candles lend their soft radiance to the living room and studio. Here one could almost

imagine himself standing in the room of an old feudal castle of long ago.

There are many windows throughout the house, so that sunlight and fresh air may find a welcome. The dwelling could not be the complete, modern home of today as it is, without its several porches; the large living-porch of cement in the front of the house, and on the other side, the glass porch which will be a true sun room in the winter time, while above this is the long, wide sleeping porch.

The eaves which extend four feet all around are simply the extending ends of the roof logs. Over the latter was placed building paper, next the matched lumber, then the paper, and finally the covering of shingles.

The shingles are a point of special interest, being handmade of oak. They are thirty inches long, about six inches wide, laid twenty-four inches to the weather.

The artist does much of his work out of doors in the woods close by, where he may draw fresh inspiration from the breezes blowing softly through the tree branches around him; from the songs of the birds which do not fear his presence; from the fleecy clouds passing overhead and the soft grassy carpet beneath his feet.

And we can see how such a man with his love for nature and all out-of-doors would choose a log house with its memories of the forests and men with axes felling giant trees; of the hardy pioneers who feared nothing but their God; to represent his home also.

THE FRONT ENTRANCE TO THE "CABIN IN THE WOODS."

Log houses in the backwoods have been built ever since the times of our forefathers, but it remained for an artist — a dreamer —to incorporate the log cabin into a log mansion, with all the modern conveniences and improvements of today—a most artistic blending of the happiest features of the present and the past. This home represents the artist's individuality.

When the Sea Reclaims

AFTER FOURTEEN YEARS BENEATH THE WAVES.

The *Maine* is shown lying within the steel-walled cofferdam. The hull of the wreck is incrusted with barnacles and other marine growth that accumulated during her long submergence at the bottom of Havana harbor.

Its Dead

by John C. Howe

ANY naval constructor who has designed a big battleship will tell you that the tensest moment of his life was the interval between the smashing of the bottle of champagne on her bow as she started her slide down the launching-ways and the splash as she hit the water. Reverse the operation and take a sunken ship out of the sea and you have the nerve-racking ordeal which the United States Army engineers went through while the pumps were removing the water from the huge cofferdam or fenced enclosure which they had built around the wreck of the battleship *Maine* in Havana Harbor, to expose the shattered hulk and permit of an examination into the causes of her destruction on Feb. 15, 1898.

But the men whom General Bixby had delegated to raise the *Maine,* Colonel William M. Black, Lieutenant-Colonel Mason M. Patrick and Major Harley B. Ferguson, had done their work well and when the last drop of water had been removed and the remains of the vessel were laid bare the massive wall around the wreckage stood staunch and watertight, and a board of naval and military experts descended into the huge hole in the sea, probed for days into the very vitals of the ship, and reported that the *Maine* had been blown up from the outside, thereby confirming the findings of the Sampson board of inquiry of 1898 and setting aside for all time any doubt regarding the cause of the disaster.

The dismembering of the hulk was then started and the after-portion of the ship, little damaged, was floated, towed out to sea and sunk in deep water amid the customary naval ceremonies for a deep sea burial. The scuttling of the battleship formed the closing chapter in the history of what was probably the most extraordinary piece of marine salvage ever attempted.

The raising of the *Maine* will always be ranked among the peculiarly difficult problems which engineers have solved. The cost was about $900,000.

Mr. John F. O'Rourke, a New York contractor, some time ago laid before the engineer officers a scheme for lifting the ship bodily from the harbor bottom. He proposed to sink along either side of the ship a row of pneumatic caissons and from holes in their bottoms pass heavy steel cables underneath the keel of the vessel at four-foot intervals. Then when he had the shattered vessel resting upon his net-work of cables he intended to lift her to the surface as one might bring up a crab in a scoop-net. This scheme, ingenious as it was, did not meet with the approval of the *Maine* board, for it was feared that any attempt to actually raise the ship would derange or break off portions of the wreckage, thereby rendering impossible an accurate determination of the causes of the explosion.

The army officers decided upon the cofferdam method. Work was started in 1910, but the building of the great dam around the ship was no easy task for the water was about thirty-five feet deep and the bottom insecure. The structure had to be made strong enough to withstand the tremendous pressure of the water from the outside without starting leaks which would flood the enclosure after it had been pumped dry.

The scheme consisted in sinking around the ship twenty huge hollow steel cylinders, each tangent to the next one, forming an elliptical ring or wall with the *Maine* at its center. These cylinders, each fifty feet in diameter, were filled up solid with clay to make them stable and impervious. Each big tube was as tall as a six-story house and was made up of several hundred steel slats or sheet piling, which dovetail into each other by means of a special interlocking joint which cannot be broken without actually tearing the steel plates apart. Then a stone re-

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THE HULL ALMOST ENTIRELY EXPOSED AS THE WATER IN THE COFFERDAM WAS PUMPED OUT.

HOW THE BOW WAS SHATTERED WHILE THE STERN WAS LITTLE DAMAGED BY THE EXPLOSION THAT SANK THE VESSEL.

PHOTO BY UNDERWOOD & UNDERWOOD, N. Y.

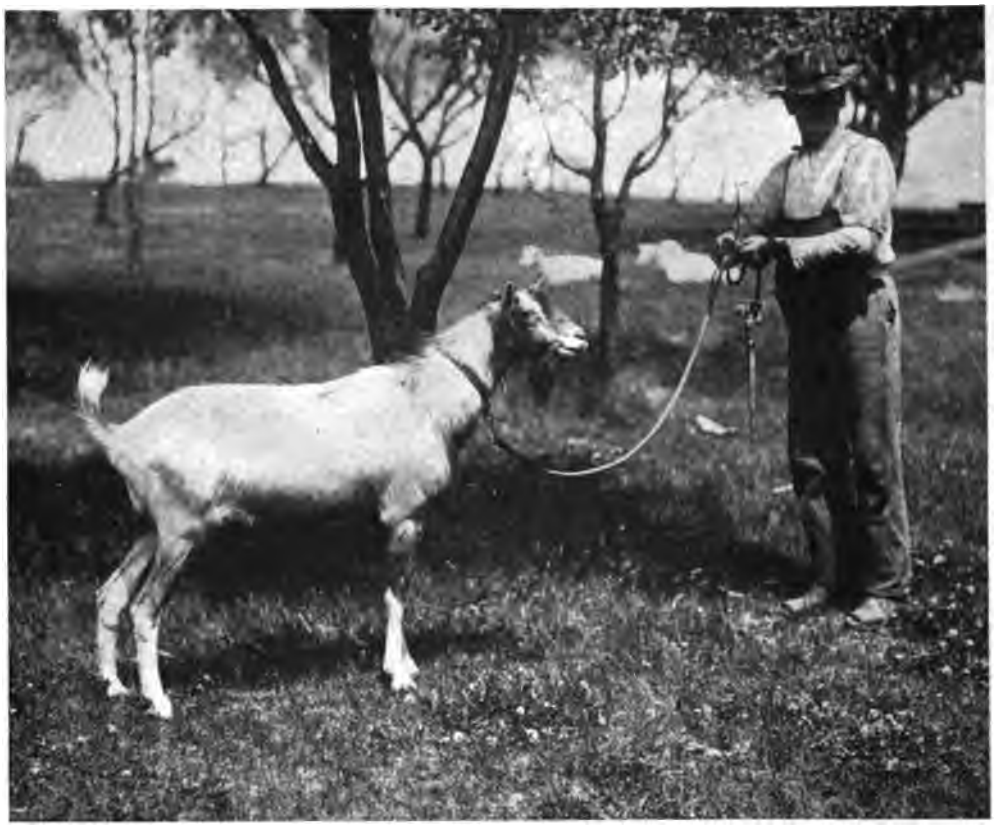
SUNK INTO FATHOMLESS DEPTHS—THE BURIAL OF THE *MAINE* AT SUNSET.
This was ordered by act of Congress.

vetment was placed at the base of the cylinders to strengthen the footings and everything was ready for the pumping to start.

It was an anxious moment for the engineers. Inch by inch the water level was lowered. Every gallon removed from within the cofferdam brought just so much pressure to bear on the outside. When the enclosure was about half empty the top of the big bulwark around the ship, as the engineers had anticipated, began to lean inward ever so slightly. There was no cause for alarm, however, for the cylinders were simply adjusting themselves to withstand their enormous burden like the guards and tackles on a foot-ball team bracing themselves to resist the backs as they come crashing through the line. The pumping continued until the cofferdam was unwatered and subjected to its maximum stress. It stood firm and the *Maine* lay exposed after a submergence of nearly fourteen years in the muddy waters of Havana harbor.

DISMEMBERING THE *Maine*.
Eating through the steel armor plate with the oxy-acetylene torch.

The hordes of workmen sent down into the pit to remove the loose portions of the wreckage and recover the remains of the seamen who had gone down with their ship found some of the huge pieces of armor plate were too heavy to be lifted, even with large derricks, and had to be cut up into manageable sizes with the oxy-acetylene torch. This little instrument shoots forth a flame of intense heat, over 6,000 degrees Fahrenheit, and eats its way through steel like a white hot bar through a cake of ice. The stern of the ship, as has been stated, was found to be not badly damaged by the explosion, so that a watertight bulkhead or wall was built amidships to allow this section to be floated. Gates in the cofferdam were then opened to flood the enclosure and the afterportion of the *Maine* was picked up by the rising water and lifted to the level of the harbor.



A PURE TOGGENBURG BUCK AT ABOUT TWO YEARS.
Full development is reached at three.

THE MISUNDERSTOOD GOAT

By

T. C. O'DONNELL

SCIENTIFIC methods of breeding have changed the goat. Today he would disown his immediate ancestors. A well-kept herd of goats are about as much like their forefathers as a Chautauqua audience simulates those sullen, low-browed creatures who ages ago gathered at Stonehenge for pagan worship. American goats have not all been regenerated; there are thousands of herds that remain as undesirable from the standpoint of milk production and as malodorous as ever. But a beginning has been made, and dozens of herds throughout the land testify to the benefits to be derived from judicious inter-breeding and from keeping strains and breeds pure.

Goat's milk is superior by several points to cow's milk. In the first place, the goat is singularly immune to tuberculosis. This immunity is by no means absolute; exposure and poor housing conditions, for instance, are capable of producing disease, but if the individuals of a herd are otherwise vigorous and healthy

it is improbable that tuberculosis is present. Again, goat's milk is of particular value in the sick room and in the feeding of infants. It does not contain less casein than cow's milk, but the curds which form in the stomach are smaller and softer than those of cow's milk, and consequently are more easily digested. Of fat it contains even more than does cow's milk, but the fat globules are likewise smaller, thus facilitating fat digestion and assimilation—so small, indeed, are the fat globules of goat's milk that cream does not rise to an appreciable extent, the fat particles remaining suspended in the milk.

The qualities which recommend the use of goat's milk for the infant also indicate its use in the sick room, where every particle of the patient's strength that can be spared from food digestion is needed to aid recovery. Expert breeders say, indeed, that the growing popularity of the thoroughbred goat is due to a great extent to the influence of physicians, who after observing the beneficial effects in the treatment of disease, themselves buy and advise others to buy one or two animals for supplying the family with milk.

A REMARKABLE CONTRAST.
At right, an American kid of six months; at left, a Saanen kid of four months.

SAANEN DOE OF TWO YEARS, WITH FOUR MONTHS' OLD KID.

THREE OF "BLUE BLOOD."
In the middle is a pure Saanen kid valued at more than $100. At left and right Toggenburg buck and doe respectively, sired by the famous "Crown Prince of the Seine."

"MERRA" (AT RIGHT) AND "IDLEWILD."
The one is an imported Swiss Toggenburg doe, the other half Toggenburg and half native American.

There is a widespread opinion—among those who have never tried it—that goat's milk has an offensive taste. A young couple who spent their honeymoon in a remote but romantic region supplied with milk by goats found a fly in the ointment of their happiness. Owing to a "spleen" against goat's milk

FULL BLOOD AND HALF BREED.
The goat at the right is an imported Swiss Toggenburg, six years old. The other is half-American.

they used milkless coffee and milkless tea and—think of it!—milkless breakfast cereals for several days, until one morning the bride had the temerity to try the "weest" taste. As she did not drop dead her husband followed suit, and comparing notes they came to the conclusion that it was almost tasteless, except for a rather sweeter and more delicate flavor than cow's milk. So pleasing, indeed, is the flavor of goat's milk that people quite accustomed to it spurn cow's milk.

Only within the last score of years have we in this country begun to perceive that in the milch goat we have an industry capable, if fostered and developed, of figuring mightily in the economics of our nation. The following table shows the number of goats in the year 1908 in a few of the leading countries of the world. Bearing in mind that we have an immensely greater population than any of the states named, particularly Switzerland, with its 3,315,443 inhabitants, one sees how slow we really are to grasp our opportunities:

Country	Number of Goats
Germany	3,533,970
Greece	3,339,409
Italy	2,714,513
Spain	2,807,963
Switzerland	362,117
Cape Colony	8,699,414
Argentina	3,245,086
Mexico	4,206,011
United States	1,870,599

The improvement of American herds has thus far been confined chiefly to the importation of pure Swiss stock. Now, sixteen distinct breeds of milch goats have been enumerated in Switzerland, of which three have found favor in the eyes of the American goatherd. These are the Saanens, the Toggenburgs, and the Swartzenburg - Guggisbergers.

"KING COOK," A TWO-YEAR OLD TOGGENBURG VALUED AT $100.

The Saanen, a beautiful creature, snowy white, is the largest of Swiss goats, withal, a notable milker, centuries of careful selection for milking qualities having produced an animal that gives from four to six quarts daily. Individuals have been known to yield seven and a half quarts.

Vying with the Saanen for popularity among breeders and goat dairymen is the Toggenburg. This goat has been called "the aristocrat of the milch goat family," and with its fawn-colored coat, usually short and sleek, and marked by two strips of white, one on either side of the face, and white legs below the knees, most people would be willing to concede the distinction.

A THREE YEAR OLD GUGGISBERGER BUCK.

The Guggisberger — or Swartzenburg-Guggisberger — does not possess the engaging appearance of the two breeds already named, but is an excellent milker, and possessing a hardy nature it is often used in crossing with the Saanen to produce the combined qualities of milk and exceptional vigor. Like the Saanen and the Toggenburg, the Guggisberger is a hornless goat, though a horned specimen is occasionally found.

America presents climatic and soil conditions that are peculiarly favorable to developing a superior breed of milch goats. In Switzerland a flock of goats is sent, on the arrival of spring, up the mountain sides, going higher and higher as the snow-line recedes, halting only when it becomes stationary. The goats remain out during the entire summer, finding protection from inclement weather in shelters built for the purpose, and browsing on such vegetation as may be at hand. They are tended by one or more goatherds, who live in shacks stationed at convenient intervals.

At the approach of winter with its deep snows the flocks return to the valleys, where they are housed for the winter, never once seeing the outside of their stables. Winter feed consists of a mere handful of hay a day, with a few oats or mixed grain.

Now American breeders insist that if goats kept under these conditions really pay their owners, they will be of untold value in our own country, where the winters are not so rigorous nor so long as among the Alps; where a greater variety of food can be obtained in ampler quantities; and where vastly better markets are at their command—potential markets, at least. Then, too, we possess plenty of the right kind of land, for goats thrive best on a porous soil, be it sandy or gravelly, preferably in a dry climate. They have an aversion, on the other hand, to low, swampy land; goats which have become thin and lifeless on such soil will quickly regain their health and activity when transferred to higher, well drained land. Thoughtful breeders, in fact, say that conditions here in America favor the development of a breed of goats that will excel in every respect any of the Swiss breeds.

THE LIZARD'S BASE. 14.000 FEET ABOVE SEA LEVEL. SAN JUAN MOUNTAINS. COLORADO.
The great cragged peak toppled from its base in January of this year.

MOUNTAIN PEAKS CRASH TO EARTH

By

GUY ELLIOTT MITCHELL

THE Lizard's Head, about twenty miles southwest of Telluride, Colorado, rises nearly fourteen thousand feet above sea level. In the middle of the winter, the topmost pinnacle, towering to a height of one thousand feet, lost its balance and came crashing down the mountain side, a matter of tens of millions of tons of rock. Fortunate it is that no mining town stood in the pathway of this rock avalanche, else the country would have been horrified with news of a disaster such as the tragic

Elm landslide of the Swiss Alps or the rockslide of a few years ago which wiped out a goodly portion of the town of Frank, Alberta.

In years past extensive areas in the vicinity of the Lizard's Head have been subject to monstrous rock and land slides, in some instances the entire faces of large mountains having been demolished. The last landslide occurring in the San Juan Mountains was also fortunately in an uninhabited area. It occurred in 1886 in the Cimarron Creek Valley, covering about three square miles and every living creature in the area must unquestionably have been killed outright. The scene of the slide was visited within a few days by Whitman Cross, a geologist of the United States Geological Survey accompanied by a photographer. The area had been well timbered but the trees were all overturned, broken down, or standing at various angles, presenting a weird picture. Bare slopes were exposed and fissures left gaping. Yet this slide, according to Doctor Cross was largely surfical, a soil slip rather than a rock or landslide, and possibly not to be compared with the rockslide at Lizard's Head.

It is the younger mountain systems, geologically speaking, which are most subject to these rock avalanches. The Himalayas, which are comparatively recent examples of mountain building, have constant slides which would constitute great catastrophes were their slopes and valleys populated. Sir William Conway describes an instance of rock tumbling which caused the formation of Gohna Lake in the central Himalayas where the spur of a large mountain mass pitched bodily into the valley below. The front of the mountain had been undermined by springs and in the twinkling of an eye a large part of the moun-

FRANK, ALBERTA. AFTER A ROCKSLIDE THAT WIPED OUT THE GREATER PART OF THE TOWN.

THE EDGE OF A "ROCK STREAM."

THIS ROCK STREAM FLOWED DOWN THE MOUNTAINSIDE LIKE THICK LAVA. THREE-QUARTERS OF A MILE LONG.
San Juan Mountains, Colorado.

ENGINEER MOUNTAIN WHICH HAS BEEN SCALPED BY ROCK AVALANCHES.
San Juan landslide area, Colorado.

LANDSLIDE OF RED MOUNTAIN SLOPE, COLORADO.
The entire area is a jumble of various kinds of rocks, with tree trunks strewn in every direction.

tain slid down and shot across the valley, damming its river with a lofty wall. Masses of rock were hurled a mile away. It is estimated that this slide carried with it eight hundred million tons of rock and debris. Plenty of Himalaya rockslides quite as extensive as this, have been recorded in the last half century, while among the remote and uninhabited regions of the great ranges rockslides are of constant occurrence.

The formations of the Colorado landslide-area point to many such slides as these in times past. Fortunately this wholesale catastrophe era is ended for the mountains of this country, though the recent destruction of Lizard's Head and the Cimarron slide show that all danger is not past, while slides in the Alps and in Alberta indicate man's mining operations may precipitate such disasters.

The landslide areas of Colorado show that in the earlier days, recent geologically, but probably scores of centuries before the coming of man, there must have been terrific times among our mountains. To the geologist the evidence is plain that there have been thousands of slides, and some of them of enormous magnitude. Possibly the great sabre-toothed tiger which ranged the valleys below, and the giant dinosaur upon which he preyed, along with other prehistoric animals heard the terrifying roar of the descending rock masses; but if so, man knows it not, for the exact age of the older and greater disturbances can be only guessed.

STRIPPING "RIPE" CARP OF THEIR EGGS AT ONE OF THE HATCHERIES OF THE GOVERNMENT FISHERIES BUREAU.

CARP—THE FOOD OF THOUSANDS

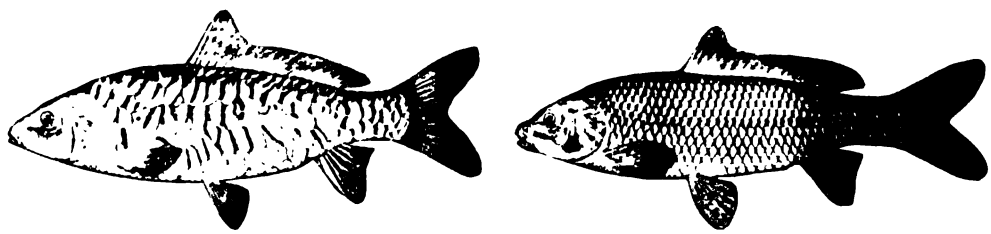
By

JOSEPH E. HENNESSY

RECENTLY the Minnesota State Board of Game and Fish commissioners turned down the application of a Hebrew dealer in carp and other "rough fish," who had asked permission and was willing to pay $550 in cash for the privilege of seining in two of the lakes of Minnesota—and to take nothing but the "rough fish," throwing back all species of game fish.

The reasons for the action of the Commission in refusing this offer which was permitted by the laws of Minnesota, were found to be that this particular fisherman had cleared nearly $15,000 during the past year and it was considered advisable by the Commission to give somebody else a chance.

This Hebrew was only one of more than fifty fishermen who cleared a comfortable fortune in one year. As a matter of record, fifty-six fishermen in Minnesota and along the shores of the Mississippi River in both Minnesota and Wisconsin reaped a harvest of dollars



TWO VARIETIES OF GERMAN CARP. THE MIRROR AND THE SCALE.

amounting to approximately $150,000 during the past year by seining the inland lakes and the Father of Waters for carp, buffalo, sheep head and other "rough" fish and shipping carloads to Chicago, New York and other Eastern markets.

The carp, which is considered the most valuable of either of the three species mentioned, is marketed in many ways and government experts who have investigated have brought to light facts to show that in many cases the fish is sold for salmon after being colored and further that in some cities it brings as high as eighteen cents a pound as "smoked sturgeon."

The fishing for "rough" fish is essentially a poor man's game and while the fisher is making a comfortable fortune he is also ridding the lakes of the carp which anglers declare are harmful to the game fish. This last assertion is hardly borne out by facts but it is well known that even the government officials say that carp is fit for nothing except to cultivate as food for bass and other game fish.

However, the breeding of this article of food has cost the government a very small amount, except as an initial experiment, while the cultivation of bass, which comparatively few people in the large cities ever tasted, has involved the expenditure of thousands of dollars. It is less than thirty-five years since the government first experimented with the fish which is now the means of founding comfortable fortunes, and it is only about sixteen years since official notice was first taken of the carp in the annual reports.

THAWING OUT FROZEN PIPES BY ELECTRICITY

By

A. H. MILLER AND DR. L. K. HIRSHBERG

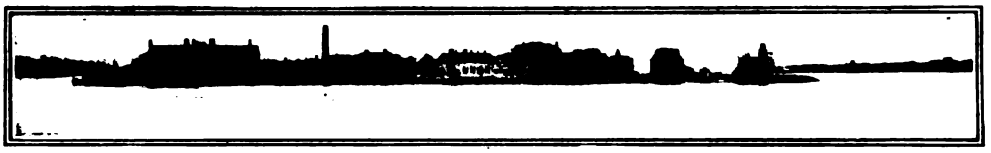
EARLY in spring a New York City firm of contractors received an order to undertake the startling task of thawing with electric current the six-inch water main under the East River, on which North Brother Island is dependent for its water supply.

For more than a month this pipe had been frozen and the conditions on the island were becoming serious. Although surrounded by water the inhabitants of North Brother Island were facing the prospects of a water famine. In the emergency water carts were pressed into service and taken across. Scores of barrels of water were taken over, and a government boat also came to the rescue.

Although these measures helped out, they were found to be entirely inadequate for hospital purposes, the island being devoted to a number of departments of the New York City Hospital. So alarmed were the authorities becoming over the situation that orders were issued from the Department of Health for the removal of a large number of the patients.

Not for twenty years had this pipe frozen up. The last time was in December, 1892. On that occasion after all attempts to dislodge the ice in the pipe failed, the whole thing was taken up and relaid. This is a long and expensive process, as the East River between North Brother Island and the mainland is from fifty to eighty feet deep.

The pipe rests on the bed of the river, and the fact of the matter is that a more ideal condition for freezing up a pipe could hardly be found. It's just like an ice cream freezer. The water of the river being salt water will go down as low as twenty-eight degrees Fahrenheit without freezing, while the water in the



NORTH BROTHER ISLAND, NEW YORK, WHICH HAD ITS WATER SUPPLY CUT OFF BECAUSE OF FROZEN PIPES.

pipe, being fresh must necessarily freeze at thirty-two degrees, unless it is kept on the move. That is just where the trouble came in.

Within one hour after the order was received work was under way. A bank of transformers were installed to stop the current, taken direct from the mains. A water rheostat was also installed. A cable carried the current to a point where the pipe was severed to begin the work. The pipe was also severed at the North Brother Island end and the current taken off there and returned to the mainland on the electrical supply cables and then put back in the circuit through the pipe again.

Work went on for three days without definite results.

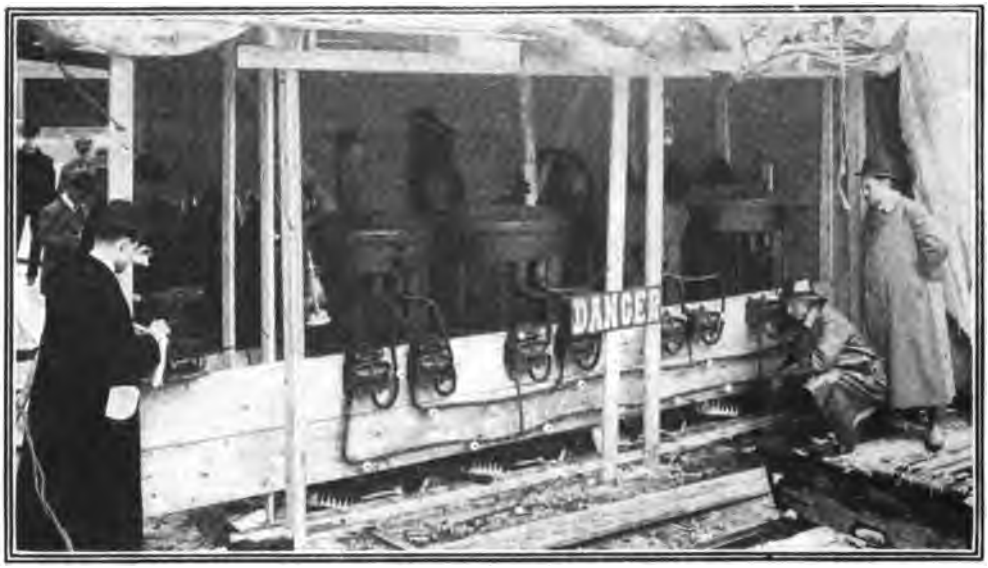
On the fourth day the superintendent tried an experiment. He had a length of pipe similar to a length of the frozen main packed solid full of ice and closed up tight at both ends. This was let down to the bottom of the river and the same current passed through it as passed through the main. It was taken up after twelve hours and the ice was found to be entirely melted.

It was not till two days later, however, that success came in thawing the water mains. Without the slightest warning water started to flow from the mainland end of the pipe. The pumps on North Brother Island which had been working all night keeping up a pressure of fifty pounds in the pipe were forcing the water through. Within a short time the flow of water proved that the pipe was entirely thawed out, much to the relief of North Brother Island's inhabitants.

During the past winter Prof. R. W. Wood of Johns Hopkins University, Baltimore, thawed out frozen water pipes in a way similar to that used in connection with North Brother Island—that is, by electricity.

When in January the thermometer column discreetly retired cold and shivering into the bulb of the tube, it registered ten and twelve degrees below even in Baltimore. Water was doled out by dry measure and the tape line. It seemed as if plumbers had actually changed places with capitalists. Finally a plumber was called to a pipe in the physical laboratory of Johns Hopkins, and worked three weeks in a vain attempt to thaw it out. Suddenly it occurred to Professor Wood that if he attached one wire of an electric current to the faucet or spigot of the pipe indoors, and another to the outlet of the pipe, he might be able to thaw it out. He turned into the 300-foot pipe a direct current. In ten minutes the pipe was completely thawed out. Within three days a large electric company were making special types of electric thawing transformers under Professor Wood's direction, and hundreds of homes in and around Baltimore adopted the method. One of the officials of this electric company devised a simple improvement on the Wood apparatus. One of the transformers was placed upon a portable truck, which could be moved from house to house, connected up with any pipe or pipes, and attached to the

DEMONSTRATING THE THAWING OF ICE BY ELECTRICITY IN THE LABORATORY AT JOHNS HOPKINS UNIVERSITY.



ENGINEERS AT WORK THAWING OUT THE PIPES THAT SUPPLY NORTH BROTHER ISLAND WITH WATER.

ordinary street current of the direct type very easily.

"I thawed a six inch main in two hours," said Professor Wood, "and a farmer who heard of it wrote me that the pipe from his barn to his house was frozen, and requested that I thaw it out for him. He enclosed ten cents as a retaining fee."

Professor Wood estimates that the cost of thawing the water pipe of average size, which would require about ten minutes and about five hundred watts, would be about twenty-five cents.

His estimate is, in all probability, high, for like all true scientists, he prefers to err on the side of conservatism rather than on the side of radicalism.

The problem of frozen water pipes had first confronted Professor Wood, when he was an instructor in the department of physics at the University of Wisconsin, Madison. The winters there are often so cold that it is no great exaggeration to say that the weather seems warm when the thermometer *rises* to zero. Water may then be purchased either by the yard or by the ton. Many of the water pipes are frozen, and water in a liquid state, especially to those who have not guarded their pipes, is not always available.

DR. R. W. WOOD.
This professor of experimental physics at Johns Hopkins thawed out pipes successfully by a device of his own.

Professor Wood, in common with his neighbors, had felt the need of some simple, cheap and quickly applicable method to release his plumbing from its congealed condition. His worries were interrupted, however, by his call to Johns Hopkins, and not till the unprecedentedly cold weather of last winter was his mind obliged to revert to the problem of thawing out frozen water pipes.

AN ITALIAN FAMILY, IN CHICAGO, ASPHYXIATED BY GAS, AND GIVEN UP BY A PHYSICIAN. REVIVED WITH A PULMOTOR AFTER TWO HOURS TREATMENT.

STAYING DEATH'S HAND

By

ROBERT H. MOULTON

A GROUP of men hurrying to work in Chicago one recent cold morning were suddenly halted by a series of strange guttural shrieks which issued from a tenement building near at hand.

"What on earth is that?" asked one.

"Sounds like a parrot," answered another.

"I never heard a parrot making a sound like that before," replied the first. "Let's see what's the matter."

Hastily entering the building, they traced the cries to a room on the top floor. They tried the door. It was locked. They rapped loudly. There was no response. Then one of them stooped and peeped through the keyhole. He saw nothing. But a strong odor of gas caused him to stagger back.

"Gas!" he exclaimed.

Putting their shoulders to the door the men soon forced it in. Stifling, deadly fumes filled the interior. As soon as the fresh, cold outer air had dissipated the gas to some extent, they entered the room. In one corner a parrot screamed with raucous insistence. Looking about, they discovered the cause of the parrot's excitement. Lying unconscious on the bed were a young Italian, his wife and their two year old baby.

The cause of their asphyxiation was apparent at a glance. On the night before—a night of blizzard and bitter cold, with the snow blowing in blankets about the gables of the frame building in zero blasts—the couple had lighted a small gas heater and had left it burning when they went to bed. The rubber tube that connected the gas jet with the heater had become detached and the gas had poured into the room in a deadly flood.

One of the men happened to be a physician. He bent over the white, motionless faces on the pillows.

"I'm afraid they are dead," he muttered.

He placed his ear to the woman's bosom. No heart beats could be detected. He placed his finger on the artery in her wrist. As far as he could make out from this cursory examination the woman was past the aid of a physician. He turned to the man and repeated the experiments. The result was the same. Then taking a hand-mirror from the dresser he held it to the man's mouth. An almost undistinguishable vapor blurred the glass. The man was breathing—he was alive!

The physician began the work of resuscitation, employing the old fashioned methods traditional with the medical fraternity. But he worked with little heart. He realized his task was hopeless. Then suddenly he remembered and sent for aid.

A little later an automobile drew up at the curb in front of the tenement and two young men hastily descended. The first carried what looked to be a large oak suitcase, and the second a small metal tank. Shouldering their way through the crowd, they ran up the stairs and entered the chamber over which death brooded. The first young man looked at the still forms on the bed.

Quickly opening the case, a queer device was brought to view. It looked like an odd conglomeration of rubber bags and tubes and brass cylinders. The young man and his assistant connected the device with the metal tank by means of a tube, adjusted a valve, caught the unconscious man's tongue with a pair of forceps, drew it gently outward and applied a rubber cap to his mouth and nostrils. Then he pulled a lever which set the machine to pumping oxygen into the gas impregnated lungs. In a moment the man's breathing became perceptible. It grew stronger. It became stertorous. His chest began to rise and fall. His fingers twitched. His arm moved slightly.

The operative next turned to the woman and pursued the same method with her. Her case at first seemed even more hopeless than the man's, but within five minutes after the pulmotor had begun to pump its life-giving oxygen into her lungs she, too, was breathing distinctly.

Attention was then turned to the baby and after a few minutes work it, also, began to breathe.

For an hour and a half the young man worked over the three, each in turn. At the end of this time life was throbbing through the veins of them all with renewed vigor. The pulmotor had scored a triumph. It had all but raised the dead. It had brought about what seemed a miracle of resurrection. The seriousness of the case is best told by the fact that none of them returned to consciousness until five in the afternoon of the next day—being practically thirty-six hours in a comatose condition.

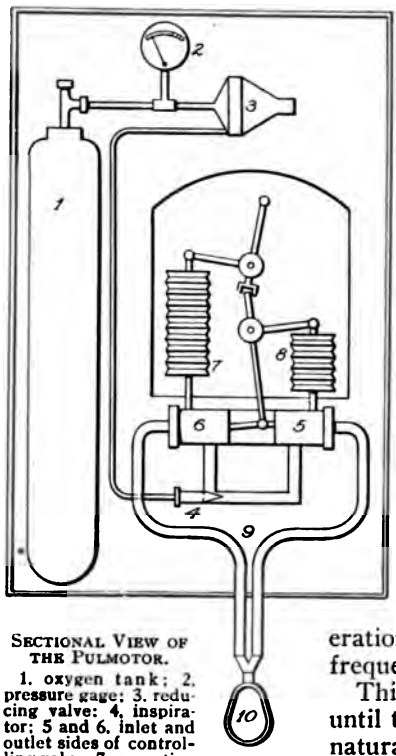
THE PULMOTOR AND OXYGEN TANK.

The device that has revolutionized former methods of reviving life after pulmonary action has been stopped by unnatural interference, leaving the body physically intact, is one of small size and simple construction. The pulmotor consists of an oxygen tank, a pressure gauge, a reducing valve, an inspirator, an operating bellows, a dashpot bellows, flexible tubing and

a face cap. These are the essentials.

An iron cylinder 3½ by 21 inches contains the oxygen at a pressure of about two thousand pounds when completely filled. This life-sustaining gas also furnishes the energy required to induce breathing in the following manner:

The oxygen from the tank flows through the reducing valve, which at the outlet side maintains a pressure of about seventy-five pounds, and from there to the controlling valve. Initially, the passage to the lungs is open through the controlling valve. The latter connects to rubber tubes leading to a metallic face cap with a rubber rim that closely fits the patient's face. The face cap on one side is provided with a rubber bag, which permits a pair of forceps to protrude by means of which the patient's tongue is held from obstructing the pharynx. The oxygen then has free access to the lungs.



SECTIONAL VIEW OF THE PULMOTOR.

1. oxygen tank; 2. pressure gage; 3. reducing valve; 4, inspirator; 5 and 6, inlet and outlet sides of controlling valve; 7, operating bellows; 8, dashpot bellows; 9, flexible tubing; 10, face cap.

When the pressure in the lungs has reached a certain value, about normal, a bellows interconnected with the lung cavity through the rubber tubes actuates the controlling valve. The pressure of the oxygen is now directed so as to create a suction over the connections which lead to the lungs, thereby causing exhalation of the gases previously forced upon the lungs. When a certain vacuum is reached in the lungs and bellows, the outer atmosphere acts upon the latter, which, in turn, operates the controlling valve and again admits the oxygen to the lungs. The frequency of these reversals depends upon the size of the lung cavity, a larger space requiring greater time, while with smaller lung capacity the operation is correspondingly more frequent.

This process is continued until the patient shows signs of natural respiration. The pulmotor action is then discontinued and the patient is allowed to breathe the pure oxygen through the other small face cap connected by a hose with the oxygen tank.

The action of the pulmotor is started simply by the attachment of the instrument to the patient through the rubber face cap and the turning on of a switch that regulates the shutoff and shuton of the battery. The fact that its own battery is attached makes possible the use of the pulmotor anywhere. There is no need of an electric current in the house where the asphyxiation has occurred.

THE VANISHING HORSE-SHOE OF NIAGARA FALLS.
Looking toward Goat Island from the edge of the Canadian Falls.

REPAIRING NIAGARA FALLS

By AUBREY FULLERTON

IT has been proposed to mend Niagara Falls, for its Beauty's sake. For some years now the engineers have been tinkering with Niagara in the interest of Industry and Power; but this newest scheme will involve some skill, not for business, but in the interest of Nature's good looks.

The Horse-Shoe Fall, between Goat Island and the Canadian shore, has long been admired for the circling contour as well as for the grandeur of the cataract. But it seems that there has been gradually a getting away from that shape.

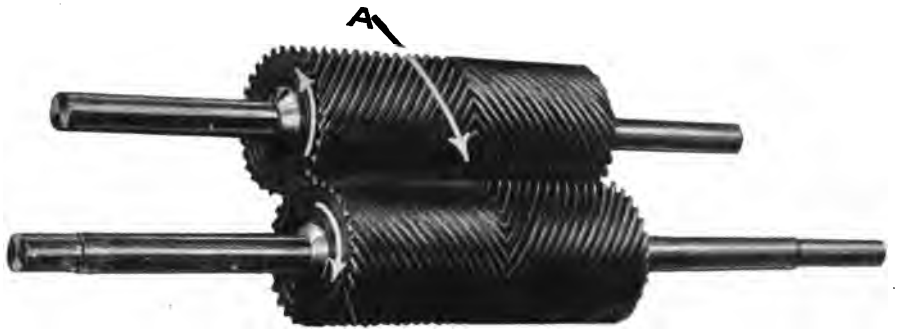
The power works have had a contracting influence and have tended to concentrate the force of the cataract upon its center. There was always, to be sure, a tendency in this direction, but the engineering liberties that have been taken have apparently added to it. The result is that the Horse-Shoe Fall is now pouring with such force over the central part of the precipice that it is wearing away the rock.

The photograph is taken from the water's edge on the Canadian side, just where it tumbles over. One may see how the outline of the waterfall is indented, running away back into the channel of the river. That is the spoiling of the horse-shoe. The photograph somewhat exaggerates the indentation, perhaps, and gives it too square a look, because the view is lateral and loses the impression of width which gives the circling shape: if the camera could have been set directly in front, and at the same level, it would have shown that the apex of the horse-shoe is V-shaped, to the disadvantage of its scenic effect.

For many hundreds of years Niagara has been wearing back on its ledge of rock. It would, of course, be impossible that a low-water discharge of 168,700 cubic feet per second could continue day and night for centuries without some wear and tear on the rock that it tumbles over; and the precipice of the Falls is today seven miles up-stream from where it began ages ago. The wearing process is still going on, but there's a difference. Seven miles of rock-eating went on with no one to see or care: a few feet of it nowadays brings observing men to attention with an engineering scheme.

That scheme is nothing less than filling up the V-shaped crevice and restoring the horse-shoe. Temporary towers to be erected on the Canadian shore and Goat Island, and between these to be stretched a double cableway; huge blocks of concrete then to be carried across this cableway, directly over the crevice, and dropped straight into it—that is the plan. There is no telling how much of this concrete stuffing would be required, for the depth of the erosion is unknown, but it is believed that the crevice can be filled and the waterfall set forward again to its original line. It is at this point that the greatest volume of water goes over, and the wearing-away is likely to do further mischief unless arrested.

THE INVENTOR
WITH HIS
THIRTY HORSE-
POWER MODEL.



THE ROTORS OF THE NEW TINY TURBINE ENGINE.

A HANDFUL OF ENGINE

By M. M. HUNTING

THINK of a three-fourths horsepower steam turbine, the moving parts of which are so small you can hold them in the palm of your hand, then think of the possibilities of such an engine built in large proportions. One can hardly realize that such power lies dormant in a simple pair of spiral gears, yet they form the active part of the most powerful turbine in the world for its size.

The engine is the invention of Mr. John H. VanDeverter and is of a design hitherto unheard of in engineering practice.

The entire plant consists of two gears, or rotors, as they are called, revolving in a closely fitting double cylinder.

Imagine these rotors turned over so that the pocket formed between the gears at the point A faces downward underneath the machine. Each tooth of the gears as it passes this point gets the benefit of the impact force of the steam or, in other words, its blowing pressure against the teeth.

As the rotors turn past this point in the direction indicated by the arrows, the steam just admitted into the V-shaped groove is completely shut off and expands until it reaches the stage indicated by the ends of the outer white lines, where its expansive power is fully expended and it passes out of the gears in a practically dead condition.

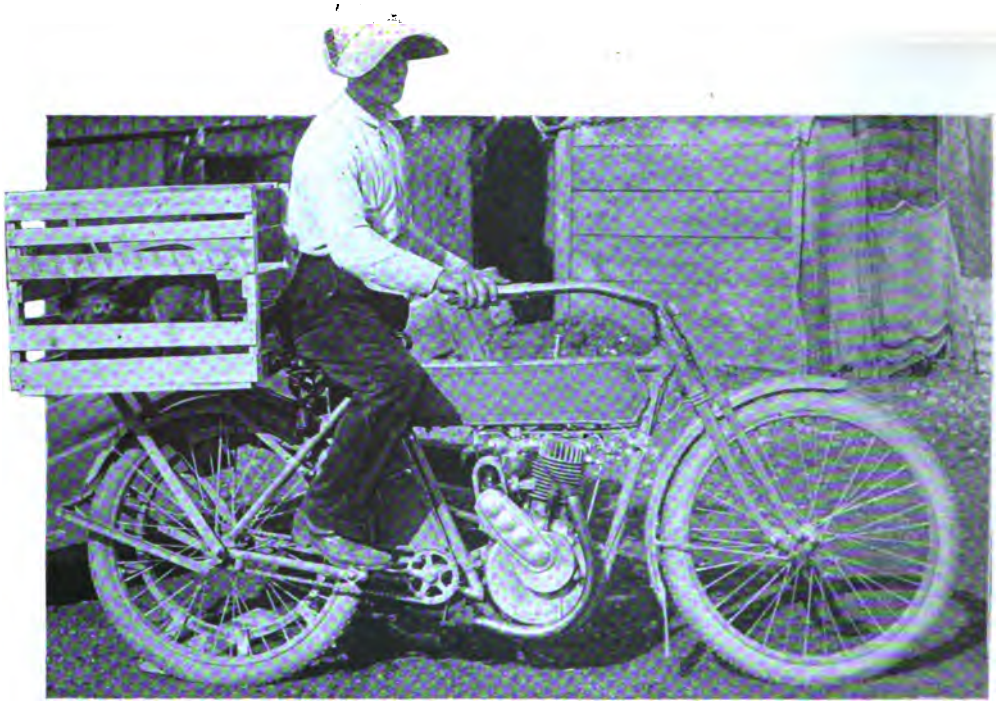
COMPARED WITH THE HAND.
Rotors of a ¾ horsepower turbine.

The great power developed in so small a space is explained by the fact that there are eighty thousand impacts or pressures against the gear teeth a minute, and the same number of expansions in the grooves, one for each tooth passing the point where the steam enters, the average speed of the turbine being about two thousand revolutions per minute.

As compared with electric motors the new turbine is smaller for the same horse power, and is from twenty to fifty per cent more economical to operate than other turbines of the same size, chiefly because of the great waste of energy through leakage in the fan type.

There are but two points exposed to wear, the bearings and the contacts of the gear teeth. In the former this difficulty is almost entirely overcome by the fact that each bearing acts as a pump supplying itself with oil from a reservoir and maintains a film of oil over the bearing surfaces as long as the engine is running.

In the case of the contact of the gear teeth a film of steam surrounds these at all times when in operation so that they are cushioned from each other.



ALL ABOARD FOR TOWN, WITH A PORKER STRAPPED ON BEHIND.

THE MOTORCYCLE ON THE FARM

By

F. G. MOORHEAD

ALONG with the interurban and the automobile has come another factor in bringing closer together the town and the country, in revolutionizing farm home conditions and in keeping the boys and girls on the farm. This new factor is the motorcycle. One prominent manufacturer reports that he sold four thousand motorcycles to farmers last year, with every prospect good for the number reaching the ten thousand mark this year. Already, one farmer out of every eight in Indiana owns and uses a power-driven bicycle, while throughout the entire Middle West the familiar chug and snort of the motorcycle, ridden by some farmer, is weekly becoming more common.

The adoption of the motorcycle by the farmer, as a sort of compromise between Old Dobbin and the automobile, has undoubtedly come about as a result of his discovery that the motorcycle is valuable not only as a vehicle of pleasure but as a quick means of transporting small burdens. In many instances the motorcycle is being used to haul cans of cream, bags of meal, poultry and small garden truck from the farm to the city, the speed with which it is possible to travel over the ordinary country road being one of the reasons for its growing adoption. The fact that most of the standard makes are equipped with carriers capable of holding a two hundred-pound load makes the motorcycle appeal to the farmer, who has learned, by experience, that it is not always economy to take the horses from the necessary work of the farm in order to make a trip to town.

In still another important respect is the motorcycle coming to figure prominently

THE COWBOY AS HE IS FREQUENTLY TO BE FOUND TODAY.

in country affairs. Rural mail carriers are using power-driven bicycles in preference to horse and buggy. The fact that a motorcycle can be operated at a cost ranging from one-sixth to one-tenth of a cent a mile and that the element of danger is being minimized—thanks to the gyroscopic action brought about by the rapid motion of the two wheels, together with the fly of the engine, revolving approximately at a twenty-five hundred-revolution per minute gait—makes this new method of rapid transportation appeal to the rural free delivery carrier, who must cover twenty to thirty miles a day and keep to his schedule.

Nor do the popularity and usefulness of the motorcycle on the farm end here. It is coming to play an important part in that grave problem of the country: keeping the farm boy on the farm. Here is the experience and opinion of an Iowa farmer who has found out that giving the boy a chance to get to town now and then opens his eyes to the real truth about the lure of bright lights:

"I first regarded the motorcycle in the light of an extravagance," says this Iowa farmer, "but as we have an eighteen-year-old boy in our home I was persuaded to invest in one of these machines. What has been the result? In a word, it was the best investment I ever made, because it has been the means of giving the boy a new interest in farm life, while Dad himself has participated in many a joy ride on this machine. We have scores of times had occasion to go to town, five miles away, on a hurry call and the trip has been made in about a quarter of an hour. We have fixed a kind of crate on the seat and can take produce to market and bring home provisions for the household and even small articles of equipment for the farm. I thought at first that the boy would spend

THE RURAL FREE DELIVERY CARRIER FINDS THE MOTORCYCLE SWIFT AND SAFE.

his evenings in town, but I find that he is fonder of home than he ever was before, because he has seen just enough of town to make him rather sick of it. I have a neighbor who is now all alone after having raised a family of four boys. He is a man nearly sixty years of age and has been operating a half-section and now depends entirely upon hired help. There was a time, in June last year, when he was entirely alone on this big farm. What would he not have given to have had one or two of his boys with him to help him out, not only in his work but to have them for companionship? I firmly believe that the motorcycle will save me from the lonely fate of this old neighbor."

CARRYING CAMP CHAIRS TO THE LAWN FOR A SOCIAL AFFAIR.

Thus it can be seen that the motorcycle, which was in the beginning the toy and later the vehicle of the city man alone, is now coming to be not only the means of transportation but the problem solver of the farmer. The motorcycle navigates country roads which Old Dobbin and the automobile find impassable and it does it speedily and in comparative safety. Its importance as a factor in making farm life still more attractive and still more profitable can hardly be overestimated.

I do the very best I know how —the very best I can; and I mean to keep doing so until the end. If the end brings me out all right, what is said against me won't amount to anything. If the end brings me out wrong, ten angels swearing I was right would make no difference.

—*Abraham Lincoln*

USING ONE RAILROAD STATION WHILE BUILDING ANOTHER ON THE SAME SPOT.
Looking west from the south end of the Grand Central terminal.

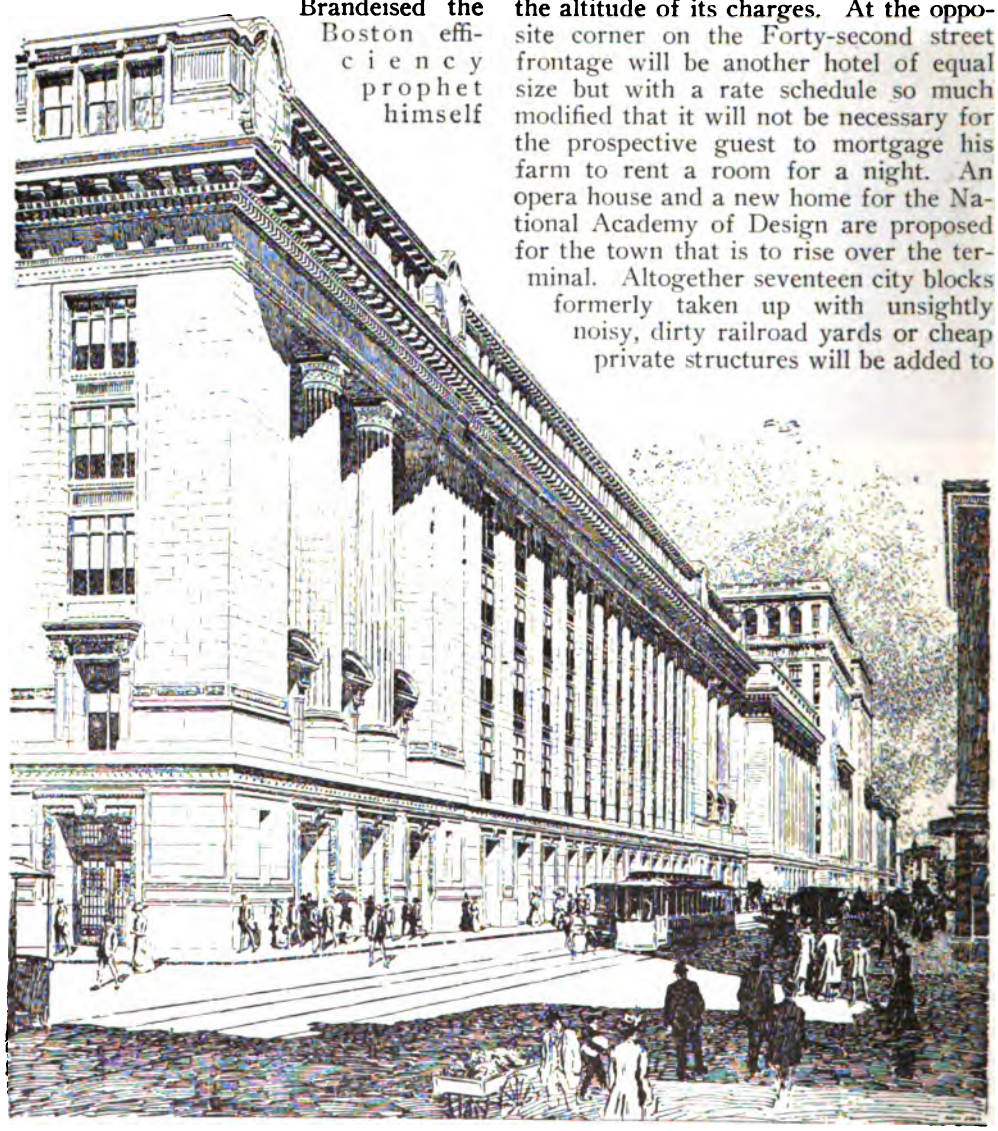
MOST MARVELOUS OF TERMINALS

By

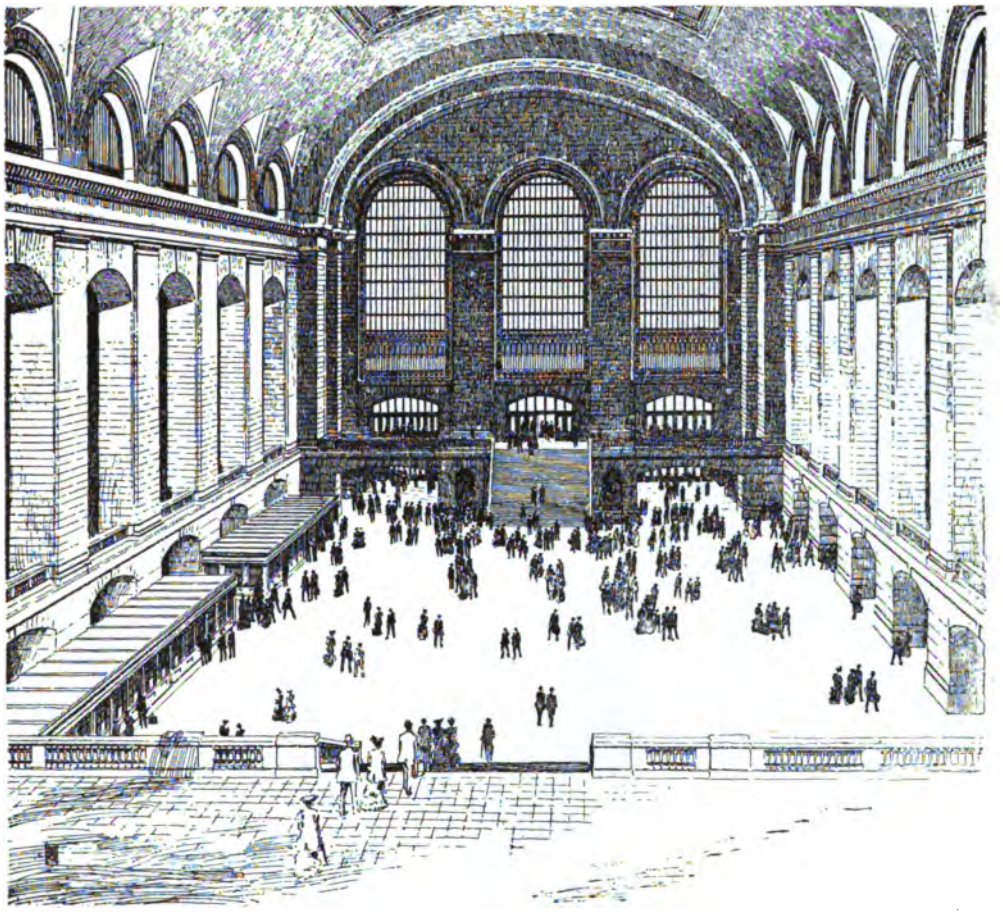
CHARLES FREDERICK CARTER

THE most wonderful thing about the new Grand Central terminal station in New York City is that it is built in the identical spot occupied by the old without interfering with or even inconveniencing traffic. It is no unusual thing for railroad engineers to replace a bridge or other structure without interfering with traffic; but such a feat has never before been performed on so vast a scale. In the last nine years the engineers have removed two hundred old buildings and twenty-five miles of pipes and sewers from the area added to the enlarged terminal, built an entire new sewer system to take care of the drainage from the terminal area, replaced the busiest railroad tunnel in the world with a new one, took down an old station and replaced it with a larger one, sunk the tracks to an average depth of fifty feet below the surface, largely through rock, and replaced it with steel and concrete, all without injuring a passenger or seriously delaying a train.

Another remarkable thing—this greatest of passenger terminals will cost nothing; or perhaps it would be more intelligible to say that while the entire improvement will cost $150,000,000, the railroad will get it all back without touching its transportation revenues. So vast an improvement in so valuable an area was quite beyond the means even of two such big corporations as the New York Central and the New York, New Haven and Hartford, which will also use the terminal. So the two companies out-Brandeised the Boston efficiency prophet himself by burying the entire terminal deep in the solid rock, roofing the excavation with steel and concrete and building a town over it. One very large commercial building twenty stories high is already completed and rented. Two enormous office buildings, to be twenty stories high ultimately, are finished up to the seventh story and occupied as offices by the two railroad companies. On one corner adjoining the station will be a twenty story hotel that will rival any other in the city in the luxury of its appointments and the altitude of its charges. At the opposite corner on the Forty-second street frontage will be another hotel of equal size but with a rate schedule so much modified that it will not be necessary for the prospective guest to mortgage his farm to rent a room for a night. An opera house and a new home for the National Academy of Design are proposed for the town that is to rise over the terminal. Altogether seventeen city blocks formerly taken up with unsightly noisy, dirty railroad yards or cheap private structures will be added to



NEW GENERAL OFFICES OF THE NEW YORK CENTRAL. ULTIMATELY THIS BUILDING WILL BE TWENTY STORIES HIGH.

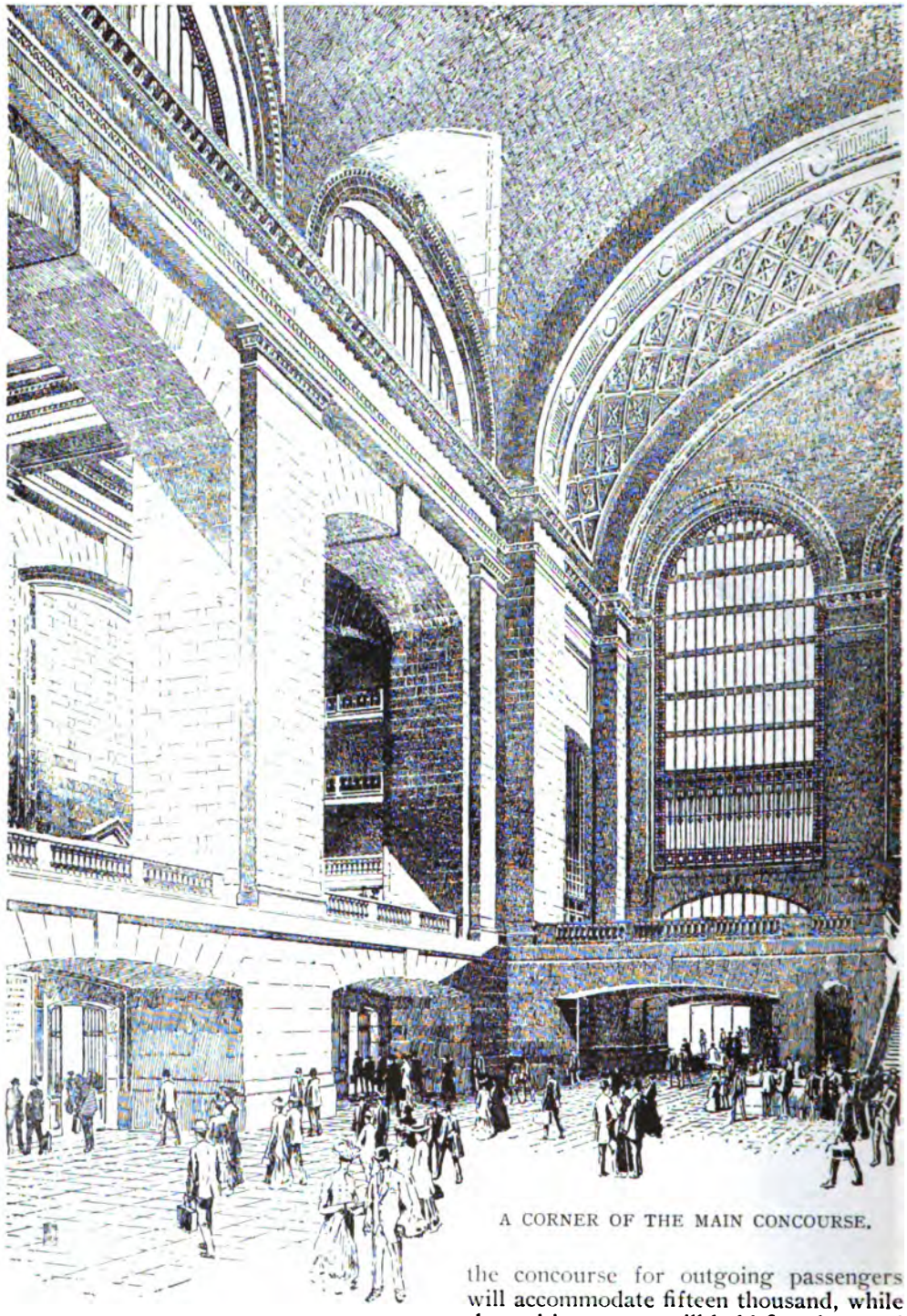


VAST CONCOURSE IN THE MAIN BUILDING.
Incoming and outgoing passengers will be completely isolated from one another.

the available building area in the choicest part of the metropolis, not to mention a fine broad avenue and a number of cross streets where such things did not exist before.

In the matter of size the New York Central terminal is so much larger than any other that it seems a shame to mention the rest. The great Pennsylvania terminal a few blocks away, the new Union station at Washington and the new Northwestern station in Chicago, all of which have been the subject of much flattering comment, and the St. Louis union station, hitherto regarded as rather a sizeable affair, could all be dumped down in the New York Central's wilderness of tracks and still leave room to add the Waterloo station in London, which Englishmen consider something of a terminal. The combined areas of five famous terminals in Europe, St. Lazare in Paris, Frankfort central station, Waterloo station in London, union station at Cologne, and Dresden central station equal less than two-thirds of the acreage of the New York Central terminal. In the length of track it contains the New York Central terminal more than equals the combined trackage of the Pennsylvania, Northwestern, St. Louis Union station, St. Lazare and Cologne stations. Perhaps these comparisons may serve to inspire proper respect for the seventy acres included in this titanic terminal with its sixty-seven tracks, aggregating about thirty-two miles, and its thirty platforms.

The concourse, which in this instance is not an open, wind-swept platform, but an



A CORNER OF THE MAIN CONCOURSE.

enclosed, properly lighted and heated area, for incoming passengers will hold eight thousand persons without crowding, the concourse for outgoing passengers will accommodate fifteen thousand, while the waiting rooms will hold five thousand more, making a total of twenty-eight thousand persons that can be cared for at one time on the various levels.

To handle this enormous traffic there has been installed in a signal cabin hidden in the depths just beyond the train platforms the largest electric interlocking machine ever built. It is in two sections, one of four hundred levers, the other with three hundred and sixty. The men never see the trains whose movements they direct. There is a director to each section who receives reports of incoming trains by telegraph. Before him is a gaudy chart of the terminal tracks in all the colors of the rainbow. Tiny electric lights burn on every occupied block, dying out as soon as it is vacated. The director decides where he will place the approaching train and calls out the track number and the route to the lever men who repeat the order, then throw the switches and signals by pulling the proper levers.

THIS EXCAVATION, WHICH WILL BE THE DEEPEST, IS FOR A BAGGAGE RUNWAY, SEVENTY FEET BELOW THE SURFACE.

Incoming and outgoing passengers will be completely isolated from each other. Arrivals may step directly into the street a floor below the departing host, or descend to the various subway systems. Outward bound passengers will enter the station at the second story above Forty-second Street on which the station fronts. A viaduct will cross this busy thoroughfare forming a continuation of Fourth Avenue opposite the center of the building. The street will continue entirely around the building on a broad terrace at the second story level and continue on up town in a superb new avenue over the center of the tracks.

The departing passenger being naturally concerned primarily with the purchase of his railroad ticket will come to the ticket office first. After securing his ticket he can take his light baggage in both hands and his change between his teeth while he moves a few steps onward in a straight line to the Pullman office where he may secure a berth. From here he will continue a few steps farther to the baggage office. In this modern terminal the passenger will never see his trunks nor the room that contains them. Instead of that he will hand his ticket and claim check over a counter to a polite attendant who will shoot them through a pneumatic tube to the baggage room far down in the depths and a block or two away. After the trunk has been checked the duplicate will be returned with the ticket by pneumatic tube to the waiting passenger who can now take his seat in the train without having taken one unnecessary step. He will have to descend one floor to reach the through trains but he will not take an elevator nor walk down stairs. The few stairways are for ornamental purposes, not to walk on. Yet trains arrive and depart on different levels. The commuters have a complete station all to themselves underneath the express tracks and about fifty feet below the street surface. Still farther down below the suburban tracks are baggage runways seventy feet below the level of the street.

THE ENTRANCE TO THE "SIPHON," YUMA IRRIGATION PROJECT.
The tunnel, one thousand feet in length, is driven through sand-stone rock fifty feet below the bed of the Colorado River.

FORCING FRUIT IN NATURE'S HOTHOUSE

By

RENÉ BACHE

WHAT may not inaptly be called the outdoor hothouse of the United States will be rendered enormously productive by that remarkable engineering achievement, the Colorado River "siphon," now just completed.

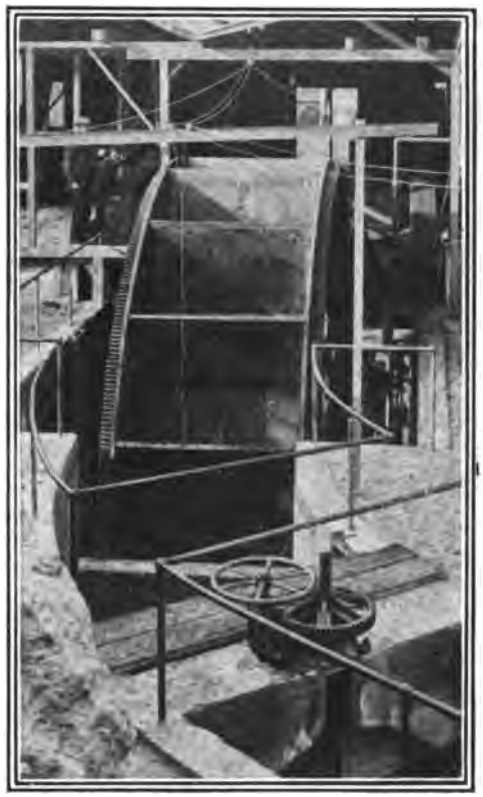
A great engine at a pumping plant already established on the Arizona side of the Colorado River drives an enormous wheel which operates as a sort of scoop. At every turn it scoops thousands of gallons of water out of a concrete-lined canal, and, lifting it high into the air, pours it out upon the mesa lands through a system of canals and ditches. Every revolution of the wheel is made audible by a click-click of the mechanism, which is music to the ears of the fruit-growers.

This, on the Yuma Reclamation Project, is the hottest region in the United States, barring Death Valley; yet such a thing as a case of sunstroke has never been known there, although the farmers work outdoors all day long. At night they sleep outdoors on porches protected against mosquitoes by wire net. But the Indians and Mexicans, who have done most of the hard labor in constructing the irrigation works, commonly build their houses of a few poles, with a brush roof and two or three blankets on the side where privacy is most desired. Such a dwelling, representing the extreme of the simple life, costs about one dollar.

In the valley lowlands, on the Arizona side of the river, Egyptian cotton of long, smooth staple is raised on a scale of productiveness unapproached anywhere—though it is found necessary to grow the plant three or four years before it be-

comes properly acclimated. There are not less than one hundred thousand acres of lands available for cotton-growing, and it is reckoned that this area is capable of producing enough of the fiber to clothe all the people of the United States.

One of the problems met with for watering these lands along the Colorado arose from the unstable character of the great river, which is constantly shifting and overflowing its banks. When the site for the magnificent structure known as the Laguna Dam, some distance upstream, had been decided upon, it remained to be determined how the water there impounded should be carried down. The first idea was to carry it through a big canal along the Arizona side of the river; but this would have made it necessary to fetch the water across, or beneath, the Gila, which flows into the Colorado from the east.



THE BIG WHEEL SCOOPS WATER FROM THE CANAL AND CARRIES IT UP AND OUT OVER THE MESA LANDS.

The Gila, unfortunately, is even more irregular in its habits than the Colorado. One never knows where to find it. Next year it may be flowing a mile away from the channel through which its current today is passing. In consideration of which fact, it was decided to bring the water from the Laguna Dam down on the California side to a point below the mouth of the Gila, and then carry it beneath the Colorado River by means of a tunnel —the lands to be irrigated being mainly in Arizona.

This tunnel, with the vertical pipes leading to it on the two sides of the river, is the famous "siphon," which is now just finished. The vertical pipes, lined with concrete, are 140 feet deep, and are connected by a cylindrical tunnel, likewise lined with concrete, with an inside diameter of fourteen feet. The tunnel, one thousand feet in length, is driven through sandstone rock fifty feet below the river bed.

At first it was attempted to do the boring with open headings, but the material was so porous, and so much water flowed in, that it was necessary to resort to the compressed-air method.

TYPICAL MOSQUITO-PROOF HOUSE WITH SLEEPING PORCHES IN THE NEWLY IRRIGATED ARIZONA LANDS.

TEACHING GOOD ROADS BY SPECIAL TRAIN

By

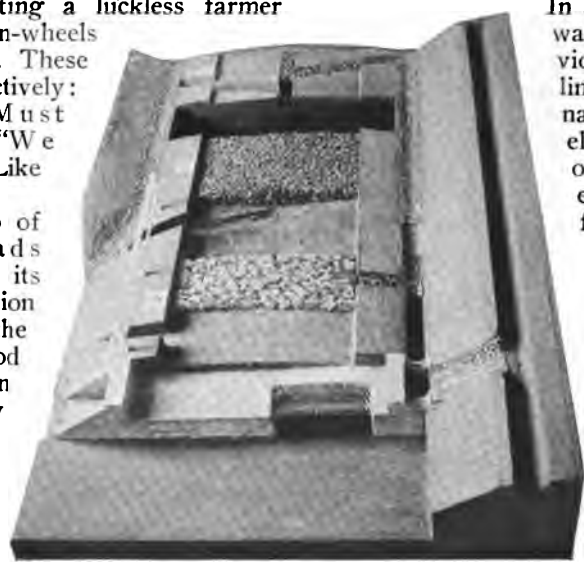
ROBERT FRANKLIN

AT every town and village along the lines of the Frisco railway system large colored lithographs of circus poster style are being pasted up on fences and dead walls, announcing the expected arrival of the government Good Roads Special Train, which left Brownsville, Texas, on March 25 for a four months' trip, to cover about fifteen thousand miles in the States of Texas, Louisiana, Missouri, Kansas, Arkansas, Oklahoma, Mississippi, and Alabama.

The posters read: "Coming! Good Roads Train. Under Auspices of Government Department of Agriculture." And each one displays two striking pictures, the first showing a man driving a wagonload of grain over a fine, smooth road, with comfort and cheerfulness, the second representing a luckless farmer with his wagon-wheels mired in a slough. These are labeled respectively: "What We Must Have," and "We Have a Lot Like this."

Now, the trip of the Good Roads Special has for its object the education of the public in the advantages of good roads and in methods whereby such roads may be built. But, incidentally, it furnishes a whole lot of entertainment, as may be judged from the fact that it carries along with it a sort of museum on wheels, together with a complete outfit for popular lectures illustrated with magic lantern pictures. One of the cars, indeed, is fitted up as a traveling lecture hall, with a seating capacity for eighty people. The fact that the entire show is free lends to it an additional attractiveness.

The train consists of a locomotive and four coaches. The first coach abaft the tender contains sleeping quarters for the train crew; also a kitchen outfit to prepare meals for all hands, including the crew, two representatives of the government Office of Roads, one official of the railway, one man from the Texas State Highway Department, and one officer of the American Association for Highway Improvement.



MODEL ILLUSTRATING ROAD DRAINAGE, WITH HILLSIDE GUTTER AND CULVERT TO CARRY WATER UNDER THE ROAD. Exhibited, with similar models, on the Good Roads Special Train.

In addition, this forward coach is provided with a gasoline engine and dynamo to furnish an electric current for operating fans and electric lights, and for running — in the exhibition car —certain miniature models of road machinery, etc., which are among the most interesting items of the whole outfit. These are in effect toys, but they serve to illustrate ideas that have an important

EXHIBITION CAR IN THE GOOD ROADS SPECIAL TRAIN.

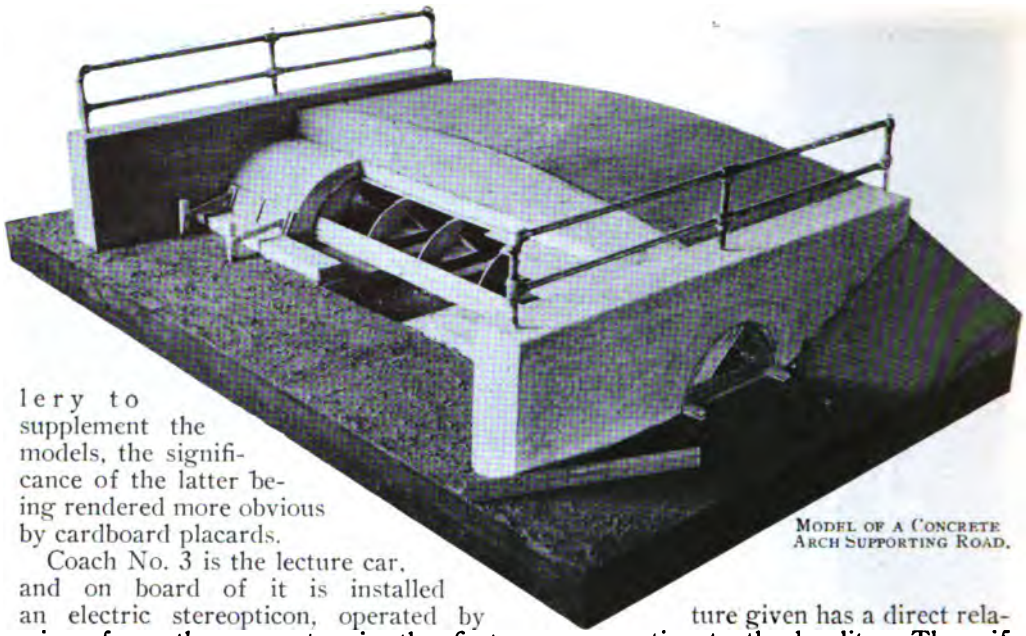
A GOVERNMENT ROAD CONSTRUCTION TRAIN.

bearing upon the problems offered for study.

Car No. 2, which is the museum, contains these and other exhibits, including eleven models representing as many different kinds of good roads. There is, in miniature, an earth road; likewise a gravel road, a sand-clay road, a plain macadam road, several forms of bituminous macadam—tar, oil and asphalt—and a brick road. Different forms of standard construction are shown, and, with varying spans, of reinforced concrete culverts and bridges.

There is a miniature working model of a three-wheeled steam roller, exactly like a big one, in operation on a model road. An electric shoe that runs along one side of the little road, concealed beneath a slot, carries a current which causes the roller to move slowly up and down the road. Nothing could be more convincing.

Along both sides of the museum car are big photographs showing roads before and after improvement, according to various approved modes of construction. Thus there is an instructive picture gal-



MODEL OF A CONCRETE ARCH SUPPORTING ROAD.

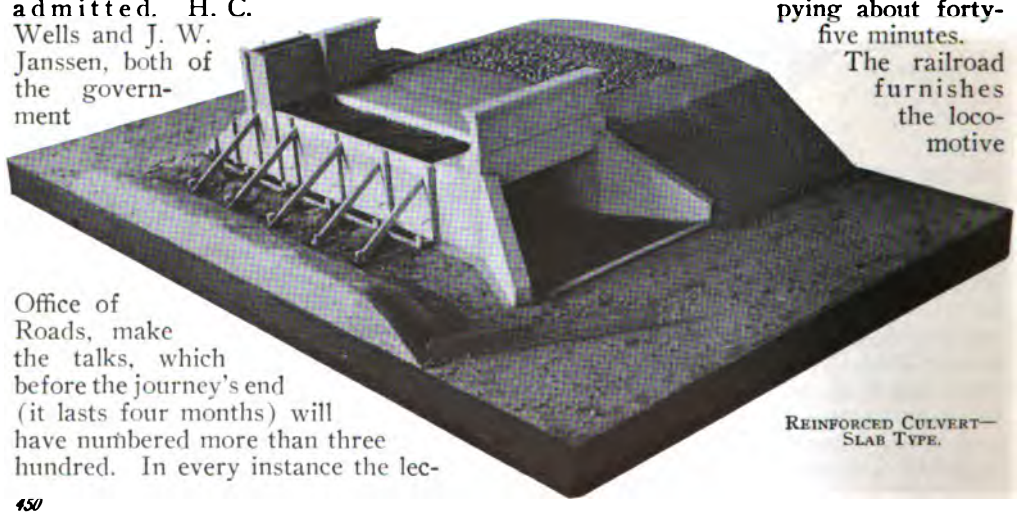
lery to supplement the models, the significance of the latter being rendered more obvious by cardboard placards.

Coach No. 3 is the lecture car, and on board of it is installed an electric stereopticon, operated by wires from the generator in the first coach, by which views illustrative of methods of road-building are thrown upon a screen. For this purpose a sheet is hung across the middle of the car, the audience being seated on both sides of it. The pictures look just the same from both sides, except that, if there happens to be any reading matter on them, it runs backward from the viewpoint of half the spectators.

It often happens that a good many more than eighty people want to hear the lecture and see the magic lantern pictures—in which case the car is emptied at the termination of the entertainment, and a fresh audience of auditors is admitted. H. C. Wells and J. W. Janssen, both of the government Office of Roads, make the talks, which before the journey's end (it lasts four months) will have numbered more than three hundred. In every instance the lecture given has a direct relation to the locality. Thus, if there is no rock in the neighborhood for road building, the discussion is of sand, clay, gravel, and ordinary earth as materials.

Coach No. 4 is relatively unimportant, merely furnishing living, sleeping and eating quarters for the representatives of the Office of Roads and other officers accompanying the expedition.

The train will cover the entire mileage of the Frisco system, having made its start from Brownsville because that is the farthest southern point and the weather is getting warmer. Ordinarily the stops are for only three or four hours at each point, the lecture occupying about forty-five minutes. The railroad furnishes the locomotive



REINFORCED CULVERT—SLAB TYPE.

and cars, and runs the train at its own expense. Also, it installs the electric outfit. But the Federal and State officers pay the regular fare for the distance covered, and meet the cost of their own subsistence—incidentally, of course, providing the models, the stereopticon, and other exhibition material.

Wherever the Good Roads Special has stopped, it has met with an enthusiastic reception. In fact, the amount of popular interest aroused has been surprising. People have come in all sorts of conveyances for considerable distances to see the traveling exhibition and listen to the lectures. They have gone away not only instructed but edified, having grasped the idea of the importance of good roads as never before. At the same time, they have come to realize that the government, through its Department of Agriculture, is taking a serious interest in their welfare, and is anxious to help them. Inspired by the object lessons offered, they will in many instances form organizations of their own for the promotion of such improvements, and the outcome in a general way will be of substantial benefit to the population over a wide extent of territory.

THE RISE OF RICE IN ARKANSAS

By

F. G. MOORHEAD

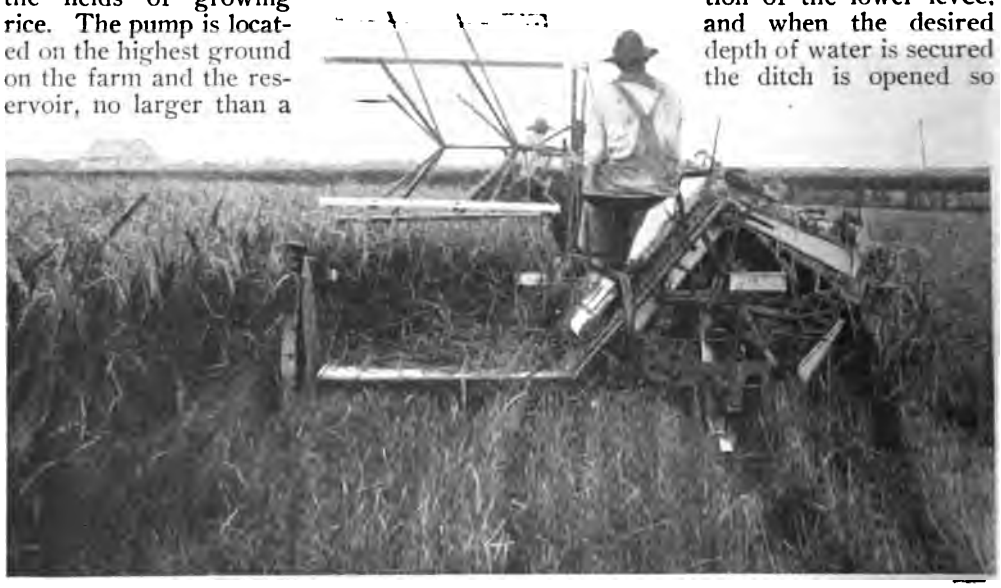
SEVEN years ago rice was a comparatively unknown quantity in the grain inventory of Arkansas. The original upland rice grower of that state did not quite go to the extent of trying the experiment in the family bath tub, but the neighbors laughed fully as much as though he had. He planted the seed in a little corner of the garden and kept the rice bed under water for weeks, carrying the water in a pail night after night. When the crop was harvested it wasn't more than enough to make croquettes for the average sized family, but the Stuttgart enthusiast who had worked so diligently took paper and pencil and soon proved that at that rate he could raise one hundred bushels to the acre, where Texas and Louisiana, with all their swamps and marshes and lowland rice fields, were only producing between thirty and thirty-five bushels.

That was the beginning of upland rice growing in Arkansas. Today the Grand Prairie, a strip of country fifty miles wide and a hundred miles long in the north central part of the state, has practically one hundred thousand acres of upland devoted to rice, the yield ranging all the way from fifty to one hundred bushels to the acre. There isn't a state or a country doing as well and Arkansas grows its rice on high, dry lands. Arkansas rice growers are not getting web feet paddling around in marshy lowlands, although their bank accounts are growing as lowland rice growers' bank accounts were never known to grow. One may ride for hours past continuous fields devoted to rice and flooded by artificial means, thanks to the never-ending sup-

SOMETIMES THE WATER IS CARRIED IN CANALS FOR MILES, GIVING LIFE EN ROUTE TO THE RICE.

ply of pure, sparkling water pumped from an inexhaustible underground source by means of the steam-driven wells with which the country is irrigated. This splendid water supply is the secret of success of the Arkansas rice growers. Water is invariably reached at a depth of from fifteen to forty feet.

The wells are sunk one hundred feet farther and pumps with coal, wood or gasoline fuel force the water to the surface and to a nearby reservoir from which it is distributed to the fields of growing rice. The pump is located on the highest ground on the farm and the reservoir, no larger than a bedroom and only three or four feet deep, is made to catch the flow. A double furrow is thrown up around the area to be irrigated and the field thus enclosed is laid off in sections with the plow, each furrow marking a four-inch fall of the surface. Then a small ditch is plowed from the reservoir straight to the lower end of the farm, crossing the levees, which extend from the ditch at right angles. When a plot is to be irrigated a few shovelfuls of earth are thrown into the ditch at the intersection of the lower levee, and when the desired depth of water is secured the ditch is opened so



RICE IS HARVESTED IN ARKANSAS THE SAME AS WHEAT IN THE NORTHWEST.

that the water can flow into the next section, and so on until the entire field is flooded, when the pumping is relaxed and the water thereafter is supplied only in a quantity to make up for seepage and evaporation.

Irrigation begins when the plant is from five to six inches high and continues until the maturity of the rice, a period of from seventy-five to ninety days. Then the ditch is opened at the lower end of the field and the water, which is of no further use, passes off, permitting the heaviest harvesting machinery to enter the field a few days later.

All this is in marked contrast with the primitive methods still prevailing in Oriental countries, in which most of the world's supply of rice is grown, for notwithstanding all its progress in rice-growing in recent years the United States only raises one three-hundred-fiftieth part of the world's crop. In Japan rice fields, the plow is rarely used. The soil is dug up and worked over with a mattock; the rice is sown in beds which are watered and carefully tended till the plants are six to ten inches high when they are taken up and transplanted in fields already submerged several inches with water. The rice is cut by hand with an instrument similar to a sickle, bound in small bundles and hung upon poles to dry, the threshing and the winnowing likewise being done by hand. The average yield per acre, after all this hard manual labor, is only about thirty bushels; while the Arkansas farmer, on his uplands fed by the underground water supply, never goes out into his submerged fields, never soils his hands transplanting and never harvests or threshes by hand, yet raises average crops fully twice that of the Jap's. The average cost of growing an acre of rice in Japan is $38.00—including labor, fertilizer, land tax and the other items—which makes each bushel of rice cost the Jap grower, at harvest, $1.29. In the meantime the Arkansas rice grower has been raising rice for six or seven years at an average acre cost of about $20.00, which has made his rice cost, at harvest, something like twenty-seven or thirty cents a bushel. There isn't much talk of "the yellow peril" in the Grand Prairie upland rice fields. The Jap has been beaten at his own game there.

But Arkansas is not content with beating the Jap and the rest of the world at growing rice. It is going to try the experiment of putting a brand new kind of rice on the market: unpolished rice. Heretofore the trade has demanded a highly polished rice, a grain from which not only the hull and the cuticle has been removed, but likewise the extreme outer surface of the rice grain itself; a grain, moreover, which has been dusted with glucose and talc to give it a glossy coating. Now all this made for a much nicer looking rice than the grain as it comes from the scouring brushes, with the hull and thin cuti-

TWO WELLS IRRIGATE THIS TWO HUNDRED ACRE RICE FIELD NEAR WERNER, ARKANSAS.

cle removed, and the berry unpolished. But the rub is just here: does the addition of glucose and talc constitute an adulteration; a violation of the pure food law? The Department of Agriculture has made a thorough investigation, as a result of which Secretary Wilson has filed a report in the course of which he says:

"It is the opinion of the Department that no coating of any kind can be used in the manner indicated if the product "be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed. It is held by the Department that rice treated in the manner indicated above with glucose and starch should be labeled in all cases with the name of the extraneous substances, as, 'Coated with glucose and starch.' In such declarations all of the food substances used for coating should be mentioned. Any coloring matter or other substances that may be employed to change the tint of the rice should be declared on the label. The question of the wholesomeness of paraffin, talc, or other non-food substances used is to be construed in such a way as to protect the health of those most susceptible to their influences. Rice is a diet often prescribed for those suffering from impaired digestion. The use of paraffin in such cases is at least of questionable propriety, and in the opinion of the Department it should be excluded from food products."

Think of sending a child to the corner grocery store to lisp some such order as this to the clerk: "Pleath, my mamma wanth a nickleth worth of rith coated with glucoth and starth." There isn't a jury in the country but would exonerate the child for losing the nickel or buying "all-day suckers," instead.

Arkansas rice men are going to be the first to come to the rescue of the family errand runners, the corner grocer and incidentally a goodly proportion of the rice eaters of the country. During the past summer a company was organized at Hickory Ridge and almost five thousand acres of new rice lands were opened up, all the crop from which is to be run through a mill at Hickory Ridge and put on the market in an unpolished condition. Some day the Department of Agriculture is going to stop the sale of glucosed and talced rice, unless explicit labels are used, and the Arkansas folks believe there is a lot in being in on the ground floor.

Incidentally it may be added that Arkansas raises more bushels to the acre than any other state or country in the world of this cereal that feeds more people than all the corn and oats and wheat put together.

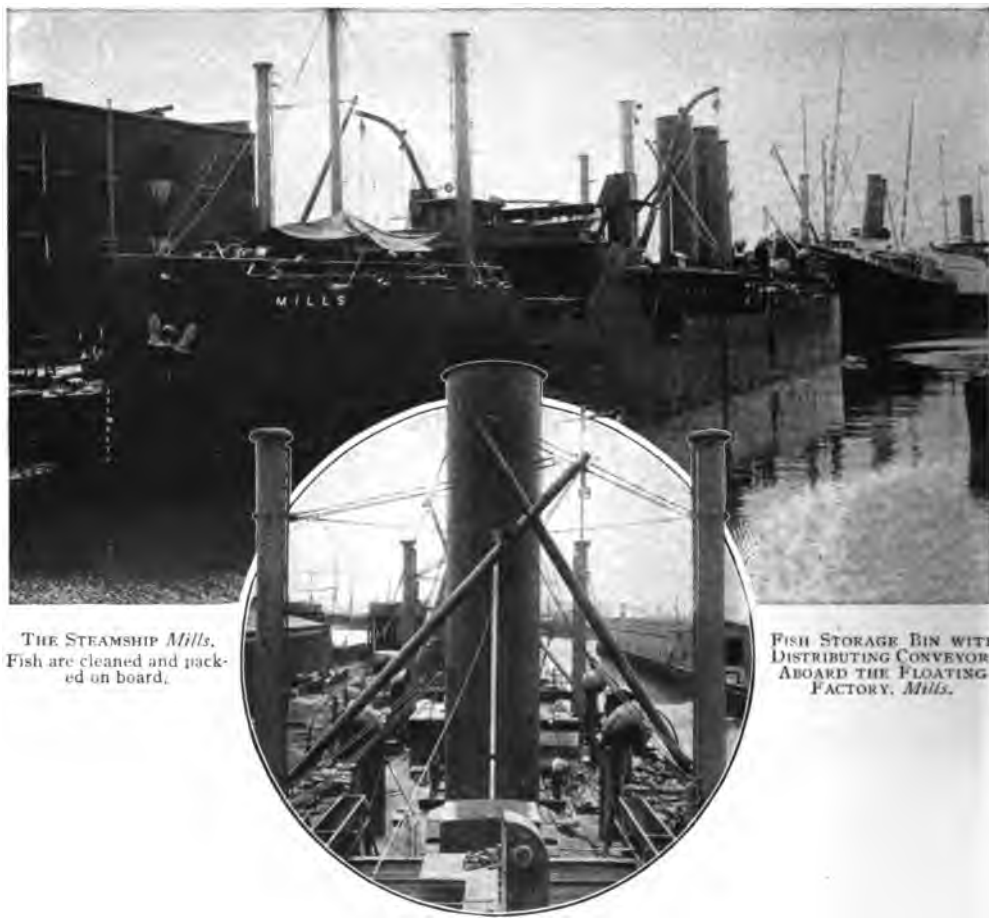
This is shown in the Year Book of the Department of Agriculture. Arkansas raises more rice per acre than any other state, and rice is practically the only food that passes the lips of nearly sixty per cent of all the people of the earth from one year's end to the other and is the main diet of near seventy-five per cent

THRESHING AND SACKING RICE.

POURING FROM UNDERGROUND AT THE RATE OF TWO THOUSAND GALLONS A MINUTE.
Irrigating the rice fields by means of an artesian well.

of them. Rice has a greater importance than is often realized.

So, one of the lesser states of this great commonwealth — Arkansas—stands pre-eminently in the front rank of one of the world's most important cereal industries. Arkansas is not to be sniffed at, to be treated with scorn. It is to be regarded with considerable respect. Arkansas is a "coming" state.



THE STEAMSHIP *Mills*. Fish are cleaned and packed on board.

FISH STORAGE BIN WITH DISTRIBUTING CONVEYORS ABOARD THE FLOATING FACTORY, *Mills*.

OIL PRESSED FROM FISH AT SEA

By

ARTHUR ST. GEORGE JOYCE

A LARGE fleet of small steamers ply up and down the north Atlantic coast, as near to shore as the law will let them, netting up the menhaden or "mossbunkers" by the million. Now the menhaden is a small fish that is unfit for food, but rich in oil, and after that is extracted, the various chemical elements entering into his composition make him desirable as a fertilizer. So it has a great commercial value, and as it is prolific and there are thousands of billions of the species afloat in the Atlantic, it is worth going after.

So for many years the menhaden steamers have filled their bunkers, and steamed, heavy-laden to port, where their contents were disgorged into the factories. All this took time. The steamer often had to make a two or three day's trip to the factory and consume as much more time getting back to the fishing grounds.

As a result the plan has been evolved of building a floating factory in the form

ON BOARD A MENHADEN VESSEL OF THE OLD SORT.
At the pier.

of a steamer, which would carry supplies to the industrious fishermen and relieve them of their catch, the catch to be converted into oil and fertilizer on board while the ship is under way. A steamer was especially equipped for the purpose.

The *Mills*, as this vessel is named, has proved to be one of the most successful enterprises ever undertaken by a fishing concern. Thanks to it the little menhaden has undergone his commercial conversion before he realizes what has happened to him. He swims gaily about in the salt sea among his fellows, suddenly finds himself yanked out with a few million of his brothers and sisters and other relatives, and dumped into a great gloomy cavern. And then, still bewildered, he is catapulted into another big cavern and his life is snuffed out. Almost before he has wiggled his last wiggle he is going through a bunch of machinery and loses his identity.

The *Mills* was not originally designed for such work. She was built for a suction dredge, and later converted into a freighter. She now looks more like a species of torpedo-boat destroyer than a factory or a tramp steamship, and might prove a successful bluff in war time. But her "innards" are different. There are no magazines full of explosives, and she is not built to travel like an express train through the water.

But she is built to carry a great bulk of freight. She can carry supplies sufficient for her own needs and to help out the fishing

DUMPING MENHADEN INTO PENS AT A RHODE ISLAND FERTILIZER FACTORY.
The fish are thrown in by the thousand. It is a busy industry.

boats. Her crew drink water distilled from the sea by the latest approved apparatus. Her factory department can go night and day and turn out immense quantities of oil and fish refuse, for all of which she has ample storage facilities, and last but not least, she can store fifteen thousand barrels of food fish.

This latter feature is one of her most valuable ones. For when the fishermen haul in their nets, cast for menhaden only, they haul forth not only the oily product, but great quantities of food fish. Blue fish, sea trout, sea bass, flounders, white fish and other edible species of food fish are gathered in indiscriminately with the meek and lowly but much sought-after mossbunker. Such fish are of no use for oil production, and while they would be all right to grind up as fertilizer, they have a far greater value as food. So they are packed in barrels, and kept on ice in cold storage, and low temperatures being produced by the ship's own plant, until a few days later they are unloaded in port, and find their way to the table.

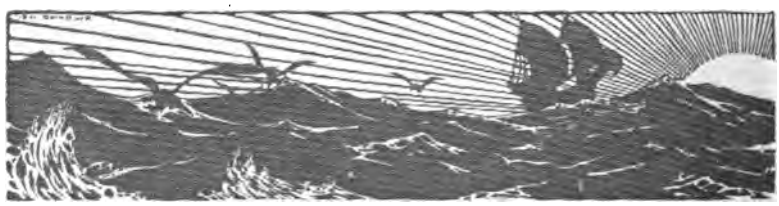
The *Mills* has two elevators, one on either side just forward of amidships, and when the little fishing steamers tie up alongside, she can handle twenty-four thousand barrels of fish in twenty-four hours. This capacity, however, is not often, if ever, attained. From the elevators the fish drop into the belt weighers, which not only weigh them, but convey them to the vaults in the hold. From there they are carried to the cookers. Then the fish, who by this time has passed from this earth, or water, and don't care what happens to his carcass, is passed through four screw presses, which squeeze all the oil and moisture out of him. The oil runs through pipes to the oil room between decks, and is there separated from the water. The oil goes to the storage tanks, which have a capacity of four thousand barrels, and the water flows through other pipes to be condensed into steam. So the little mossbunker is not only required to give up all his oil, his skin and bones and flesh for commercial purposes, but is actually required to help supply the steam with which his relatives are annihilated, and the steamer propelled.

The squeezed body is sent to conveyors which have blowers attached, and the scrap is sent flying into automatic bagging machines, drying as it goes in a few seconds, and bagged at the rate of five tons an hour.

When the vessel has taken on a full cargo, she races to port and unloads, takes on fresh supplies for the men employed by the company, and returns to her work. So instead of bringing the product to port, and wasting much time in the course of the year, she brings the finished product.

The *Mills* has a wireless equipment, too, and can keep in touch with not only the vessels of the fleet, but with headquarters on shore as well. If a fishing boat has an extraordinary catch and gets its cargo before the *Mills* is due, a flash through the air will take this floating factory to her, relieve her of her burden, and permit her to load up again.

The menhaden is a clannish fish. It usually travels in schools and the school may extend over a space sixty miles wide. Of course when a school appears, it is easy to dip the fish up by the million.



HEAD GATES OF THE LARGEST SINGLE IRRIGATION UNDERTAKING ON THE CONTINENT.
The Ambursen dam in this project is the longest in the world.

A POOR MAN'S CHANCE

By

GEORGE H. CUSHING

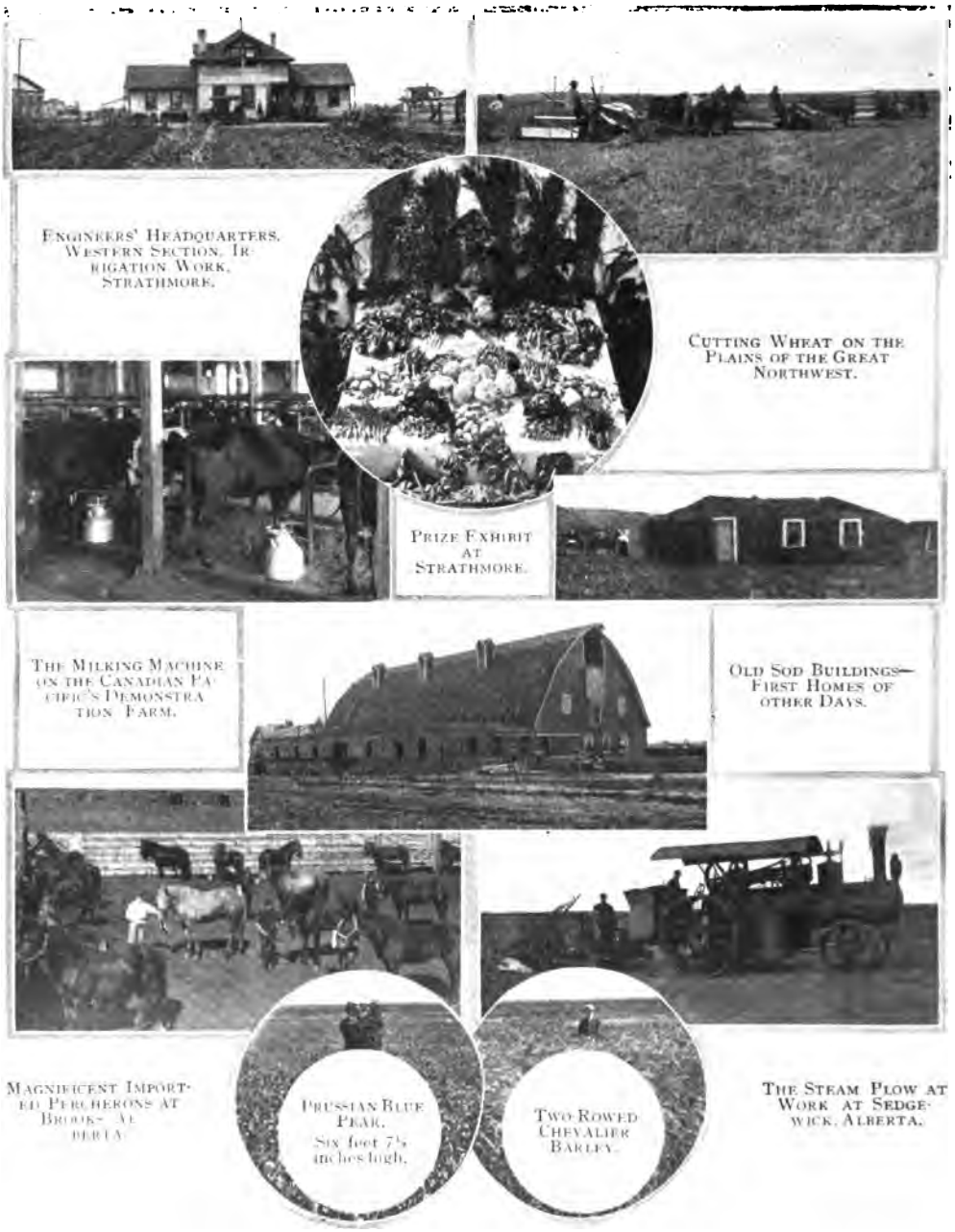
"EVERYWHERE land is being spoiled by bad farming. Some of this is done by land owners, who know no better. Most of it is done by land renters, who know better but who rob the soil that they may make money easily —and move away. Canada has the bulk of the unspoiled land on two continents. She will not lease it to have it spoiled. At the same time she wants it farmed. To attract these land renters and to build up a nation of land owners, we built our ready-made farms—farms with houses, barns, fences and wells upon them. Now, in addition, we have decided to loan money to American land renters who are proven farmers, men who have made good and who own certain farm equipment. This renter moves his equipment from one farm to another and pays the same on the new that he would pay as rent on the old. Once there he has become a land owner, and as such is as much concerned with conserving his land as he is with increasing his crop. His position is completely changed."

This is the program of Canada's greatest railway as announced by the head of its department of natural resources—John S. Dennis. He tells how easily it is all done.

"The land renter prefers to be a land owner. Anywhere he can get land on payments but he can't go any further with the financing; he can't build his house and other buildings with his ready money. We lend him what he needs; we help him past the corner."

Another thing—something beyond a chance to buy land on payments—is drawing farmers from the United States to Canada. Mr. Dennis expresses it thus:

"Irrigated farms are the oldest kind of farms. Natural rainfall may be too abundant or insufficient; either ruins a crop. Irrigation—especially when its water supply springs from the melting snows on nearby mountaintops—assures a



steady crop by preventing both drought and flood. Also water flowing to land and to crops from streams adds the mineral ingredient, which is the best of fertilizer, a thing impossible with rainfall. Also again, it is peculiar that emigration has never been away from but always toward irrigated lands. From Joseph's time, the nations have fought to own Egypt, where irrigation is natural, through the agency of the Nile."

The tillable land of the United States is filling up—a hard thing to realize—but still the immigrant horde comes to Ellis Island and demands to be taken care of, preferably on the land. One shrewd Canadian recently expressed it thus:

"As the swarm pours in over the east-

ern edge of the bowl some must be pushed out over the western edge; that accounts for the emigration from the United States to western Canada."

For forty years Mr. Dennis has been telling the truth about the vast reaches north of this country, but the tide of population was not ready to overflow from the United States and the railroads were not ready to expand. So the people scoffed and passed on.

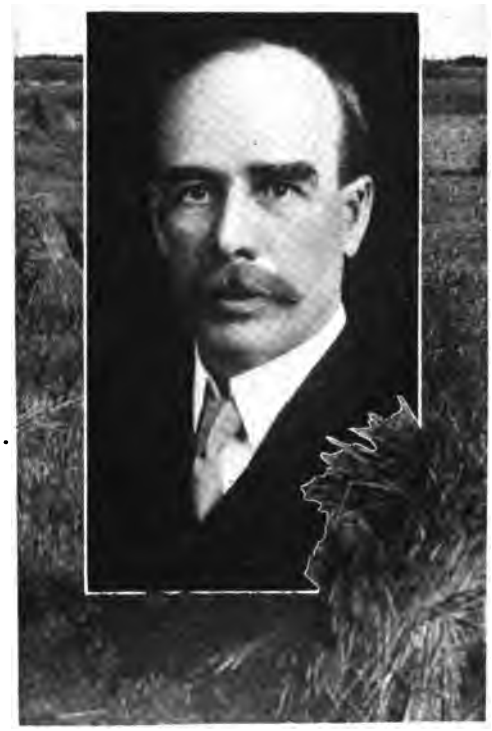
Then over the same trail went the Canadian Pacific Railway laying its line to the Pacific Coast.

Then, ten years ago, events seemed to crystallize. The Canadian Pacific took Mr. Dennis into its organization; the United States showed the first signs of overflowing; and the emigration to western Canada began.

As might be expected from a graduate engineer who had spent thirty years on government work, Mr. Dennis would do nothing until he had made an engineer's survey of the controlled land and knew what it contained. This disclosed one strip of 3,000,000 acres which to his mind was ideal for safe exploitation. It was a rectangle of land, the southwest corner of which was cut away by the Bow river and the northeast corner of which gives place to the Red Deer river. Between these streams lay a princely estate of 1,200,000 acres of lowland irrigable with the waters of the Bow river and 1,800,000 acres of uplands, dependent for cultivation upon the rainfall provided by a kindly Providence.

At the point where Bow river ceases to hover along the southern boundary and starts due north, the Canadian Pacific Railway, under the direction of Mr. Dennis, threw up its first dam and built its first irrigation ditches. By organizing a selling force in every part of the United States and England he distributed this land and settlers began to arrive and also to give freight to the railroad.

Working as the head of the irrigation department, Mr. Dennis settled part of that 3,000,000 acres which immediately surrounds Calgary—on the western edge of the Bow river district. There remained the other two strips yet to be irrigated by this water supply from Bow river and to be distributed to land settlers.



J. S. DENNIS, THE ENGINEER WHOSE EFFORTS TO SETTLE WESTERN CANADA HAVE BEEN BOUNTIFULLY REWARDED.

It was about that time that the Canadian Pacific Railway decided that since its holdings in land and other natural resources had a value of $200,000,000 they were big enough to warrant a general department of their own.

In casting about for the man who could handle this proposition, the Canadian Pacific ran over the records of those who had been serving the company. Mr. Dennis had built the system near Calgary and had sold the land which was irrigated by the ditches. What is more, he had started people to settle in that district and these settlers were producing freight which produced revenue. He was a natural choice.

One of his first undertakings under the new department was to extend irrigation to a second section of that 3,000,000 acre strip east of Calgary. The keynote of this was the new dam built on a new model and, incidentally, this is the longest in the world today. It meas-

ures one and a quarter miles. Behind that dam backs up a reservoir eight miles long and a mile and a half wide. Immediately above that dam and at the lower end of the reservoir open the irrigation canals which are fitted with locks and water checks. The whole scheme is so arranged that before any water can pass over the dam the canals must be full and before the canals can be full the farms must first have had all the water

PLOWING ON "READY-MADE" FARMS, SEDGEWICK.

they need for the crops. Thus the melting snows from the mountaintops will assure a steady supply of water; the dam assures a full reservoir; and the full reservoir assures that the irrigation canals will water the land. This means that this irrigation project cannot fail.

In conference with his agents at Chicago and again in the western department, Mr. Dennis asked the question:

"How can we get settlers into western Canada and especially into the Bow river reservation?"

The answer almost unanimously was:

"Help them to finance the purchase of that land."

One shrewd agent who had been through the central eastern portion of the United States, made this statement:

"The original owners of those farms—the men who made the agricultural sections of those states famous—are no longer tillers of the soil. They have grown old and having made money have moved to the cities. Their sons have gone into other kinds of business, mostly in the cities. The old homesteads have been turned over to land renters. These renters, with no incentive to save the soil, are taking each year's crop in the easiest and most profitable way. For a temporary policy that is good enough but as a long-time method it does not work out. In fact as one year follows another they find that their work is getting harder because of the impoverishment of the soil."

Another agent added an enlightening word:

"These land renters are mostly men of families who are not quite able to do what a growing family demands. They want to make a change. They have enough stock to equip a farm; enough farming implements; and a little money. They could make the first payment on a farm and work it until it began to yield but they could not undertake to break the virgin soil, build the houses, the barns and the fences and in addition meet the expense of moving."

Right there, Mr. Dennis put in a word:

"Suppose we loaned them enough money to do these things, how many men could you move to western Canada?"

The answer was again almost unanimous:

"All you could possibly care for."

So far as Mr. Dennis was concerned, that ended it; he was ready to go ahead with the financing. But, the Canadian Pacific Railway had to be taken into consideration. It has seventeen thousand miles of railroad—the only carrier reaching from coast to coast on this continent. That means big business with big methods. It means big departments and big department heads with big men on a big and austere board sitting over them to direct their movements. It means that nothing is considered but things which involve good business methods with a profit as the result. This board sits at Montreal and passes upon the programs which come up from any one of the departments upon that far flung line. To Montreal Mr. Dennis went as the apostle

of the prairies to plead the cause of the farm renter of the United States and of England. He wanted the big railroad to lend them money and he put it convincingly:

"You understand, gentlemen, that the money lenders will not advance money upon unimproved real estate. You know too that the banks of Canada cannot do so, being circumscribed in their transactions by proper and safe laws. Yet there are no such restrictions against this railroad. We have money which we can lend. If we should buy bonds with it—thus lending it to other corporations—we would get but four per cent. By lending this money to these new farmers we can get six per cent—two per cent more than we could get elsewhere. It is, for us, a good business proposition.

"At the same time the borrowers are becoming grain and general produce growers and that means eastbound freight for us. They will need home comforts and farm implements; that will mean west bound freight for us. Every new settler adds to the traffic of this railroad."

"How much money will it take?" put in a practical director.

"It will cost about $2,000 to put up a small but comfortable house, a barn, to sink a well, and to build a fence around the place. It might take $2,500. To finance the location of two hundred and fifty new farmers on our land, on ready-made farms, would cost $500,000 the first year."

"If these men are going to work it out, as Mr. Dennis says they are, I think we ought to be willing to lend them a little money until they get started," said one of the directors. "Almost any business man will lend his partner enough money to help him buy a house if that house is going to make the partner more dependable. I can see no reason why a railroad which has the money, should not do the same thing with the men who want to make new homes, open new farms and create for it new traffic."

With that statement the thing was done. The Canadian Pacific Railway set aside, to be spent this year, $500,000. Next year it may set aside $5,000,000. It was a good business move at that. By loaning this money at six per cent the railroad gets two per cent more, or $10,000, than it could get by loaning it in any other way. In addition, it sells two hundred and fifty farms and establishes two hundred and fifty new sources of traffic. It was a good business move for the Canadian Pacific Railway—no one of the officials claims it is anything more or less. But, it also gives two hundred and fifty men an opportunity to work farms for themselves.

THE *TITANIC*, AS SHE APPEARED LEAVING BELFAST.

CAPT. E. J. SMITH—AT RIGHT—AND HIS CHIEF OFFICERS.

TO PREVENT OCEAN DISASTERS

By

JOHN E. WHITMAN

SPEED mania, an exaggerated idea of luxury, reckless carelessness, sea lanes too far to the north,—in the path of icebergs —in the desire to shorten the route between America and Europe, an imperfect and inadequate wireless equipment, and a type of life-boat that invention should long ago have superseded—all these are factors in perhaps the most terrible drama in the annals of ocean disaster, the loss of the *Titanic*. False theory in the construction of safety bulkheads may be very properly added to the list. The human equation need not be considered in this connection. The men —officers, crew and passengers—did the best that human beings could do under the circumstances. No one can question their actions in their last moments. They gave an account of themselves that requires neither defence nor praise. Their behavior was above commendation.

Never, according to ship captains, have icebergs so huge and fields so vast in extent been sighted in the North Atlantic as they have during the past spring. Under the circumstances the charge of speed mania is well founded. Passengers' lives should count for more than trans-atlantic records. Likewise, palatial ball rooms, luxurious swimming tanks and roomy tennis courts are all well enough in their way; cramped quarters with plenty of life-boats are preferable.

But nothing can change the past. The question now is, What can human ingenuity, engineering skill and invention accomplish to safeguard the future?

Discussion after the event shows that the *Titanic,* with its double bottom and its system of vertical bulkheads, was but little safer than a vessel without these protective devices against accident, in other words that this great vessel, nearly nine hundred feet long, capable of easily accommodating over three thousand people, and supposedly very nearly unsinkable, had less of a chance for survival after collision with the unseen and sunken spur of the iceberg than an old time sailing vessel would have had. The stokers and other ship workers below at the time of the yielding of the bulkheads, who were later picked up in the sea, narrate that the vertical bulkheads were unable to resist the force of the inrushing waters.

Ship builders have immediately become fertile in expedients, to obviate so terrible a result, in their plans for future ship construction. For the vertical bulkhead it has been suggested that the horizontal be substituted, and that thereby each deck of the vessel be sealed as tightly in case of need as the bottom, itself, of the liner. Thus even should a vessel be split along the bottom from bow to stern, as was the *Titanic,* these deck bulkheads could be closed and the steamer could remain afloat till assistance were summoned by wireless or otherwise, even though she were submerged to her middle deck.

Captain George A. Chaddock, an English naval expert, says: "Ships must be made absolutely or relatively unsinkable. The decks are the true line of defense. Their hatches should be water-tight and immovable. Between decks water-tight divisions or collision bulkheads, of course, should be retained. Had the first deck above the injured bottom of the *Titanic* been seaworthy the vessel would have floated without assuming any dangerous angle until the rescuers arrived. In no circumstances can a ship as now built, with useless wooden hatches, survive anything but compara-

THE MAGNIFICENT DINING ROOM FOR FIRST-CLASS PASSENGERS ON THE ILL-FATED WHITE STAR LINER *Titanic*.

tively trifling injuries from a collision in quiet waters."

Life-boats as now constructed, and as lowered into the water, do not seem to be adequate to the demands placed upon them. In the first place they are fragile, easily capsized, hard to lower, and in danger, if the sea be at all rough, of being dashed to pieces against the sides of the vessel. There are other difficulties, too. It is an extremely hard thing to lower such a boat containing some fifty people for a distance of seventy feet. In fact, it seemed impossible to do this on the *Titanic* and as a consequence many of the boats were but little more than half-filled. Also, if the sinking ship should list to one side, as generally happens, the line of boats on one side of the vessel is likely to be submerged, the other to be raised high in the air, rendering all useless.

Recently a life-boat, cylindrical in shape like a dirigible torpedo, and designed to be launched in much the same way, was exhibited at Toronto, Canada. The inventor claims that it can neither be capsized nor sunk. It is designed to bear forty persons to safety. The apparatus consists of a double cylinder. The outer cylinder is permitted to roll freely with the action of the waves. The ends of this cylinder contain bulkheads. The inner shell is suspended from these. The outer cylinder is twenty-four feet in length, six feet in diameter. Air is drawn into the inner shell or cradle by means of a pump, through a hollow tube, which curves up on the outside, well above the water. A system of valves expels the impure air. A number of these valves are always above the water line. This boat is not lowered awkwardly from the deck of the vessel, but slides head on into the sea. A special launching device has been constructed for this purpose. Passengers were aboard when this new life-boat was first tried out. They reported that they experienced but little discomfort.

This looks like a feasible solution of the life-boat problem. Only the unprecedentedly calm ocean saved the lives of the *Titanic's* survivors whom the *Carpathia* picked up. If the seas had been rough the greater part of these ill-manned craft would undoubtedly have gone quickly to the bottom, if indeed conditions had been such that they could have been launched at all.

The question of the regulation of wireless is one that the wreck of the *Titanic* has also brought direct attention to. For some time authorized wireless operators on both land and sea have complained that the hosts of irresponsible amateurs who experiment along the Atlantic coast have seriously hampered their work. A wireless station of this sort can very easily pick up a message that is sent from a vessel in distress and thus prevent its being received by some other ship that would at once set its course in the direction indicated by the C. Q. D. signal. In connection with the disaster to the *Titanic* there seems to have been a veritable wireless chaos. Major Floyd Page, at the meeting of the London Chamber of Commerce, spoke with some heat in reference to this matter. "The United States," he said, "is the only country in the world where the telegraphs do not belong to the government, and unfortunately, it has become the fashion in that country to permit amateur wireless operators. When we read that Marconigrams can be tapped we must remember that the United States is the only country in which that can be done."

Congressional action doubtless will put a stop to this pernicious activity of amateurs. All wireless should be directly under government control.

Philosophy of La Rochefoucauld

¶ Our virtues are most frequently but vices disguised.

¶ Neither the sun nor death can be looked at with a steady eye.

¶ A man who is ungrateful is often less to blame than his benefactor.

¶ The true way to be deceived is to think oneself more knowing than others.

Second Sight

"MAMMA, our governess can see in the dark."

"How do you know that?"

"Last night out in the hall I heard her tell Father that he hadn't had a shave."—*Fliegende Blaetter.*

Kinship

"MAMMA, is Aunt Jane a blood relation?"

"Yes, dear."

"Is she one of the bloodiest we have?"—*Life.*

His Honor and Decency

A YOUNG assistant district attorney, while conducting a case wherein one woman had called another unmentionable names, put the plaintiff on the stand and directed her to tell just what the accused had said.

"But I just can't," she gasped in surprise; "why it's not fit for any decent person to hear."

"Well, then," he replied, cheerfully, "just step up and whisper it to His Honor."—*The Hampton Magazine.*

Like Real Life

"DOES the hero marry the heroine at the end of all their troubles?"

"No; at the beginning."—*Judge.*

Not Particular

"DOCTOR, how can I ever repay you for your kindness to me?"

"Doesn't matter, old man. Check, money order, or cash."—*Milwaukee Sentinel.*

His Limit

"I LOVE you!" he cried, throwing all restraint to the winds.

"Do you really and truly love me?" she answered, still unyielding.

"I swear I do!"

"How much?"

"How do I know how much? With all my heart and soul and strength and mind and——"

"Wait. Couldn't you love me any more?"

"Dearest, if I loved you any more I don't think I could stand it."

"Why not?"

"I might want to marry you."—*Cleveland Plain Dealer.*

Affection by Proxy

"I FIND that my husband has been having the office boy call me up every day and mumble terms of endearment. That's a nice way to fool his wife! He's been going to the ball game."

"How is it that you didn't catch on to the voice?"

"Well, I'm busy at bridge every day, and I've been having the cook answer the telephone."—*N. Y. American.*

Naturally

"CHARLEY," said young Mrs. Torkins, "our cook wants more wages."

"Well, I should think she would. I don't see how she can expect to keep her health unless she can afford to eat at a restaurant."—*Washington Star.*

In The Boxes

"SHALL we go into the East Side and take a look at the 'Great Unwashed'?"

"No; let us go to the opera and see the Great Undressed."—*Lippincott's.*

The Test

"IN Chapter I he shoots at her five times. Ain't that grand?"

"Yes; but them novels are misleading, Mayme. There ain't no earnest love like that in real life."—*Kansas City Journal.*

Frankness

"DID that young man kiss you last night?"

"Mother, do you suppose that he came all the way up here just to hear me sing?"—*Tit-Bits.*

A Novice

DAUGHTER—"But, mother, I don't see how you can give me any advice as to my married life when you have only been married once, and I have already been married three times."—*Fliegende Blaetter.*

Realization

"I WONDER if your sister realizes, Johnny, that during the last three months I have spent many dollars in sweets on her?"

"I'm sure she does, Mr. Sweetly; that's why she's not letting on she's engaged to Mr. Bigger."—*New York Evening Mail.*

Opera at Home

OLETIMER—"Is your married life one grand, sweet song?"

NEWLYWED—"Well, since our baby's been born it's been like an opera, full of grand marches, with loud calls for the author every night."—*Tit-Bits.*

Perhaps

"YES, sir," said the man who would not vote for a Republican, even though he was on a reform ticket, "I'm a Democrat. And so was my father and my grandfather and my great-grandfather."

"Huh!" said the candidate, "and if your father and grandfather and great-grandfather had been horse-thieves, what would you have been?"

"Wal," responded the other thoughtfully, "in them circumstances I reckon I'd 'a' bin a Republican."—*Everybody's.*

Technical Defense

"SAM JOHNSON, you've been fightin' agin. You'se lost two of yo' front teeth."

"No, I ain't, Mammy, honest. I'se got 'em in me pocket."—*Life.*

Familiar Noise

WIFE (dining at restaurant)—"John, dear, can you see what those people at the next table are eating?"

HUSBAND—"Can't see at all, but it sounds like celery."—*Brooklyn Life.*

Yes, By Gosh

TWO MEN were hotly discussing the merits of a book. Finally one of them, himself an author, said to the other: "No, John, you can't appreciate it. You never wrote a book yourself."

"No," retorted John, "and I never laid an egg, but I'm a better judge of an omelet than any hen in the state."—*Argonaut.*

POPULAR · SCIENCE & MECHANICS SUPPLEMENT ·

CAR MAKES 300 MILES AN HOUR

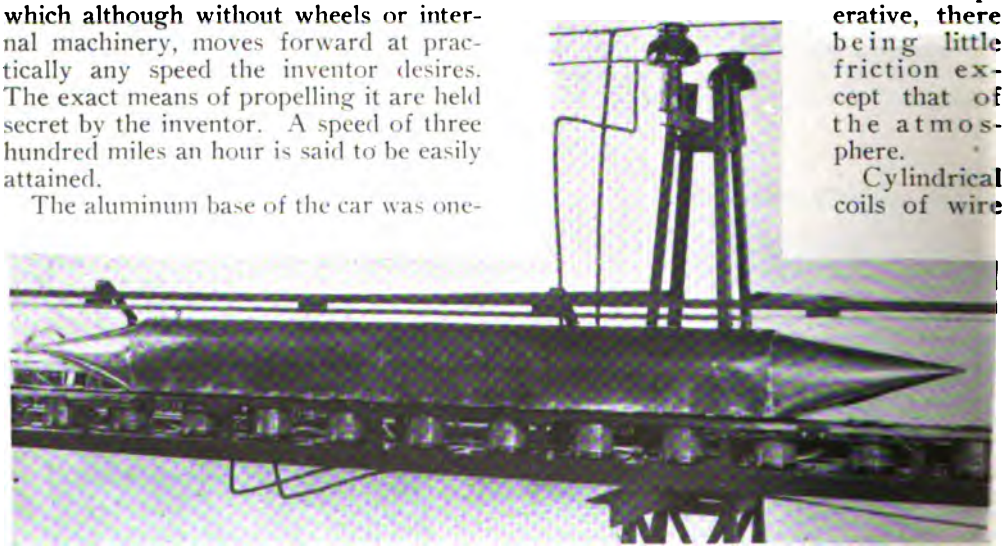
EMILE BACHELET, a Franco-American electrical engineer, has announced an entirely new discovery in the field of electrical science that is believed to forecast a revolution in the high-speed transmission of mail and express matter and passengers.

He has built a small model of a railroad car made of aluminum and steel, which although without wheels or internal machinery, moves forward at practically any speed the inventor desires. The exact means of propelling it are held secret by the inventor. A speed of three hundred miles an hour is said to be easily attained.

The aluminum base of the car was one-half an inch from the surface of the rail during each of its trips over the thirty-one-foot section of track. This was accomplished, the inventor explained, through the following means:

First, by raising and sustaining the car by means of electro-magnetic repulsion; Second, by causing the car so sustained to move laterally, at will, with great speed by means of electro-magnetic attraction; Third, by overcoming gravity while these forces are operative, there being little friction except that of the atmosphere.

Cylindrical coils of wire



WHAT THE CAR LOOKS LIKE.

with solenoids (practically large charged magnets) furnish the magnetic lateral force, leading an amateur scientist to remark that M. Bachelet had "harnessed magnetism."

Between the two lower rails are "levitating coils." As the car passes, the force in these levitating coils repulses the aluminum base of the vehicle, raising it one-half inch in the air.

The car is given direction by "brushes" which slide along in grooves in the lower rails. There is also an upper rail somewhat similar to the overhead feed wire above the trolley tracks. At each end, the car, in passing along, comes into contact with the solenoids.

ALUMINUM CAR WEIGHING FORTY POUNDS THAT IS SAID TO HAVE LIFTED A GIRL WEIGHING SIXTY-FIVE POUNDS ONE INCH CLEAR OF THE RAIL.

It is by means of the brushes that the current is automatically cut off after the car has passed over that particular section of the track.

The model car used weighed forty pounds. To work the coils sufficiently to raise the car one-half inch from the track, 220 volts were found to be required for the purpose.

"I believe that a speed of 1,000 miles an hour for passenger trains is not beyond the range of possibility," said M. Bachelet. "That is because there is practically no friction."

PYTHON FLESH FOR MEDICINE

THIS python was captured by some Chinese farmers in the hills near Foochow, in southern China. They beat it to death with hoes and clubs and then brought it to Foochow, where they sold it for four dollars, Mexican currency, or less than two dollars gold. The American who bought the snake wanted only the skin, so the Chinese kept the flesh and sold it again to some native doctors who use it in their practice. The Chinese have great faith in both the oil and flesh of snakes to cure diseases. This large snake, however, is not so highly valued for medicine as the smaller varieties. These are especially prized by the native physicians, who are evidently far behind the Western nations in the theory and practice of the healing arts.

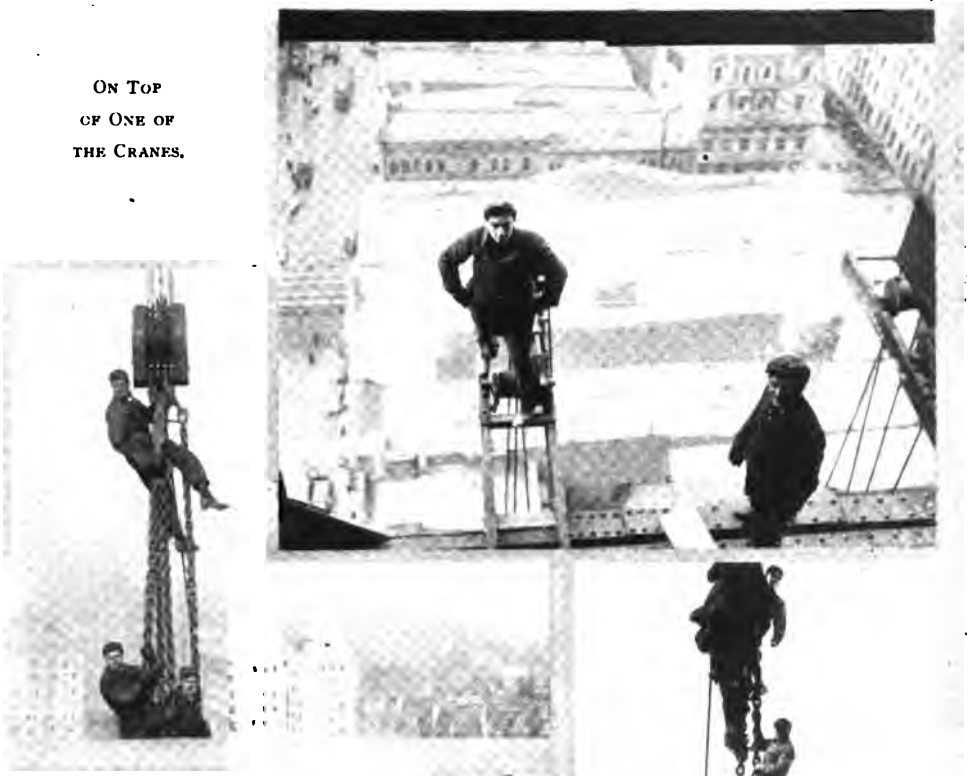
This individual was thirteen feet one inch long, with a circumference of fifteen inches, and weighed 107 pounds. This species has no fangs but kills its prey, as do all pythons, by encircling it and crushing it to death. Although a fairly large specimen of a snake, others of still greater size have been killed near Foochow.

REGAL PYTHON, WEIGHING 107 POUNDS, CAPTURED BY CHINESE FARMERS.

NEW YORK'S NEW FIFTY-FIVE STORY SKY-SCRAPER

THE WOOLWORTH COMPANY'S BUILDING AS IT WILL APPEAR WHEN FINISHED (AT LEFT) AND WORKMAN GIVING SIGNAL TO THE OPERATOR OF THE HOISTING MACHINE.

THE building will be fifty-five stories high, and its highest point 750 feet above the street. It has progressed to the thirtieth story, and thousands are daily watching the men putting up the steel construction, who do not seem to care for the danger to which they are exposed. Well may they be called by the imaginative, "cowboys of the air."



ON TOP OF ONE OF THE CRANES.

This building represents the last word in the construction of heaven-towering skyscrapers. The task of the workmen looks extremely hazardous. Think, however, of the photographer who was obliged, in order to secure this series of magnificent pictures, to place himself above these men, at a still more perilous altitude.

So long as great buildings must be reared, men must jeopardize their lives. In spite of various safety appliances that have been introduced in later years, the numerous perils to the structural steel-worker's safety have diminished but very little. As in the past, he must take his life in his hands.

GOING TO LUNCH BY A SHORT ROUTE.
These workmen jauntily take their lives in their hands, confident of their ability to look out for their own safety.

CAMPAIGNING BY MOVING PICTURE.

Speaker Champ Clark is shown posing for the moving picture operators on the floor of the House of Representatives. This is the first time that anything of this kind has been done. The Speaker went through his paces for nearly a half hour while the picture men turned the crank and recorded his various poses. These pictures will be supplied to hundreds of motion picture houses throughout the country and will be used with phonograph speeches by Mr. Clark.

SHOE FOR MOUNTING STAIRS

THE mounting of stairs frequently is a great inconvenience for convalescents and invalids, especially those suffering from heart trouble. In order to facilitate this task, a Dr. Schurig has designed a folding attachment fixed to the shoe which, when unfolded, just has half the height of a step of the staircase. Only one such attachment is used, which, if the banisters be on the right, is fixed to the left foot, and inversely, the shoe being equally adaptable.

If the person at first infolds the attachment, his body will be lifted to half the height of a step, and in order to reach the next step of the staircase, only has to be lifted another half-step by the other foot. The foot fitted with the attachment having then been drawn after, the same process may be again repeated, and so on.

HOW THE STAIR-MOUNTING SHOE IS USED.

Various devices have been invented for every imaginable physical deformity or weakness. The men who devote themselves to this sort of work are doing a great boon to mankind. Every little aid in ameliorating suffering is a step in humanity's advance. The shoe for aiding the invalid or the convalescent in mounting steps is one of those things perhaps not one in a million would think of. The millionth does think of it however, and so becomes a great benefactor to society.

A WIRELESS DIRECTORY

THE United States Navy Department has just issued a publication of great value and much interest to all persons interested in wireless telegraphy. This book gives the location of every wireless station on the globe, the call letters of each, the distance, in nautical miles, a message can be flashed, the wave-lengths in meters, and the character of stations, whether commercial, private, or the property of some government. All merchant vessels and government craft equipped with wireless outfits are similarly listed. It appears from the compilation that the United States is far in advance of any other country in the number of stations. Already it is possible to send a wireless message between almost any two points, and the network of stations is being rapidly made closer.

CHIEF KENLON OF NEW YORK CITY WITH HIS NEW MOTOR FIRE ENGINE.

The Navy Department has forty-five shore stations in operation, with two more under construction. The War Department has under its control fifty-one stations. The largest shore commercial stations in this country are located at the following places and have the ranges, in nautical miles, indicated by the figures: Eastport, Maine, 400 to 1,000; Quincy, Mass., 400 to 1,000; Atlantic City, N. J., 300 to 600; Cape Hatteras, N. C., 400 to 1,000; Tampa, Fla., 500 to 1,000; Grand Island, La., 450 to 1,000; New Orleans, La., 300 to 500.

One of the most powerful stations in existence is a private one located at Nauen, Germany, it having a range of 2,000 nautical miles.

THE LAST OF THE FIRE HORSES.

This shows the last run of the last of New York City's fire horses. It was a still alarm. The horses were decorated with ribbons. The illustration above shows what has superseded them.

TWO OF THE LARGEST LOBSTERS IN THE WORLD.
The one at the right is three feet long and weighs thirty-one pounds; at the left, twenty-eight pounds. These giants were caught off Sandy Hook.

WORLD'S LARGEST LOBSTER

THE largest lobster of the world of which there is a record has just been brought to the surface and doomed to a dry-land existence hereafter. This undisputed giant and king of all Lobsterdom measures three feet long and weighs thirty-one pounds. The average lobster of the day is nine to ten inches long and weighs two or three pounds. Another cousin of the big one, nearly as long and weighing twenty-eight pounds is with the champion to keep him company. These two deep sea marvels have just been mounted in a large glass case, at the Museum of Natural History, New York. They were caught by fishermen off Sandy Hook. For several months during the regular lobster season, the pots, according to custom, would be hauled up every other day for the precious cargo destined to delight the palate of the diners in the palatial cafes. To the great disappointment and amazement however, of the fishermen on each haul up of the pot it would be empty, besides there would be a great hole in the side and all the bait gone. This was attributed at first to the ravages of the storms, tide and the various damages incidental to the bottom. After the loss of several dozen of traps, having holes the size of a man's head, gnawed through, the alert fishermen suspecting this to be the work of a possible shark or some other large denizen of the deep, sunk a huge trap the size of a Saratoga trunk having an opening a foot in diameter. Inside was placed an extra amount of tempting bait. After leaving this on the bottom for two days it was hauled up, requiring two men to handle the line. Clinging to the pot, the half frightened fishermen saw the body of a lobster with enormous proportions, the like of which they had never seen before in all of their twenty-five years of lobstering. The huge lobster had only half of his immense frame inside the pot. He could not extract or withdraw his entangled form.

A CACTUS GARDEN—A NOVELTY OF THE ARIZONA DESERT.
The mistress and daughters of the ranch in the Southwest are not to be deprived of the gratification of their gardening instincts because they can not make a choice of plants. Hence, occasionally, these cacti gardens are created.

SWEARING IN A WITNESS.
Mrs. Mabel Van Dyke Bell is the first woman commissioner in the United States. This witness in her first case was sworn in the Federal court at Covington, Ky.

THE LITTLE CHURCH THAT LEADS TO HEAVEN

THE Church of St. Michael D'Aiguille at Le Puy Central, France, is known as the most picturesque spot in this fair country. In the midst of this little town there rise two gigantic rocks, one having a statue of the Virgin Mary and the other, as shown here, a remarkable tenth century church. The rock is 280 feet high and the church and its site are certainly exceptional. The church is said to "lead direct to heaven."

SALVATION ARMY RESCUE CORPS

BEGINNING with the postulate that no one loves a helpless inebriate and that his sole hope when he falls by the wayside is the policeman on the beat, the Salvation Army inaugurated as a part of the Lenten campaign the rescuing of the inebriate.

SAID TO BE THE LARGEST HAT IN THE WORLD—A NEW PARIS CREATION.

The Salvation Army Drunkards' Brigade is under the leadership of Major W. W. Winchell and its starting point was Jersey City. From here the members of this peculiar corps will extend the field of their operations until every large town in the United States has its own corps for rescuing inebriates who may be in need of assistance.

The workers will have as their aids the police of the district in which they work. No one will welcome the advent of these rescuers more warmly than the police. Of all the fish that fall into the net of the guardians of the peace none is less liked than the helpless drunkard. He is usually powerless to help himself, he is more likely than not a muddy scarecrow and frequently he is more fit for a bed in the hospital than a cell at the police station. There is no glory at all in arresting him. He is simply an all-around nuisance to the police and they will gladly shift the responsibility for his care to other shoulders. So that the rescuing brigade will have the active and enthusiastic co-operation of the police in their work.

HELPS THE FALLEN AND, INCIDENTALLY, RELIEVES THE POLICE.

THE LITTLE CHURCH THAT LEADS TO HEAVEN.

FIRST MOVE: THE POLE IS SAWED OFF AND THE STUMP WITHDRAWN, EITHER JACKED OUT OR PRIED OUT.

THIRD MOVE: THE SOCKET—TO RECEIVE THE POLE—IS DROPPED INTO THE HOLE.

SECOND MOVE: THE POLE IS MOVED ASIDE, WHILE THE STUMP IS PULLED OUT.

AND LASTLY: THE REPAIRED POLE IN PLACE. ITS NEW BASE WILL NOT ROT.

SAVING THE OLD POLES

IN the days when timber was plentiful in this country the railroads and telephone companies did not hesitate to replace a pole when it had become decayed below the ground but now-a-days when every pole replaced means an expense of from eighteen to twenty-five dollars, depending upon the size of the pole and the amount of labor involved, they are looking about for some means to reduce this expense.

A process for resetting partly decayed telephone poles has recently been devised by a Pittsburg man which promises to reduce the cost and labor involved in making the pole as good as new.

If, for example, the pole has become rotted away at the surface of the ground it is first of all sawn off even with the surface, then the upper portion is lifted by means of jacks and set to one side. All this without disturbing the wires at the top.

The decayed end of the pole is now pulled out of the ground and the hole enlarged to receive a steel tube having an inside diameter approximately that of the base of the pole.

The tube is from six to eight feet in length, depending upon the diameter, and has a ring formed in its surface about two feet from the top, thus bringing the inside diameter to a lesser degree at that point.

A filling of earth is placed inside the tube to the height of the ring, and the end of the pole is prepared for replacement in the tube, or socket, as it is called, by tapering the end with a draw-knife until it is of the right size to fit the ring in the socket.

A thick mixture of cement, sand and water is then poured into the socket and the end of the pole set into this. The cement mixture thus displaced fills up every portion of the socket about the pole and when hard makes a permanent repair that will last for years. After setting the pole with its socket straight in the hole the earth is tamped in about the socket and the resetting process is complete.

The time required to reset the pole is about one hour and the cost from seven to nine dollars. A new pole would cost from eighteen to twenty-five dollars.

MODEL THAT SELLS ELECTRICITY—AN EXCELLENT ADVERTISING SCHEME.

MODEL THAT SELLS ELECTRICITY

THE model shown in the illustration represents a modern two-story factory with machine shop, pattern shop, drafting-room and office, and is complete

THE CARNIVAL AT NICE, ITALY.
An annual affair that equals, if it does not surpass, the Mardi gras at New Orleans.

THE BURNING OF BUTLER COUNTY COURT HOUSE, HAMILTON, OHIO.
Crossed wires in the dome started the fire. This photo was snapped as the dome fell.

ENGLISH YOUNGSTER AND HIS MOTORCAR.

to the last detail in everything that makes up such a factory.

It was built by an American electric lighting and power company to advertise its electric motor service facilities, and has attracted considerable attention among manufacturers at the various industrial expositions where it has been shown.

Everything that is to be found in the modern factory is reproduced here in miniature. Machine tools of every variety, work benches equipped with vices and hand tools. The machinery runs and the workmen operate it in an almost life-like manner.

In the drafting-room are drawing tables, filing cabinets, blue-prints scattered about in a confusion that indicates a rush of business, while the office has a baby typewriter, roll-top desk and files of the most up-to-date type.

Every department of the shop has its own electric motor suspended from the ceiling, which drives the machinery and the whole plant is lighted with tiny electric lights hanging above each bench or machine.

The model is about six feet long by three feet high and twenty-one inches deep. It took two months to build it and it cost more than three hundred dollars.

YOUNGEST OF MOTORISTS

PROBABLY the youngest motorist in the world is Master F. Newman of Kensal Green, England, who, though only five years old, runs a perfectly constructed automobile of 1½ horse power, in which he takes as his guest his little sister, aged 2½ years. It is a gasoline car, fully equipped with a top and accessories, and accommodating four little passengers. Master Newman looks after it himself, in the garage and on the road, filling the tank with gasoline, adjusting the carburetor and all other details.

It steers from the right hand side and cranks up from the side, just forward of the front seat. It has light bicycle wheels with steel spokes, instead of the regulation artillery or automobile wheels, and is so light that the little owner can easily move it about by hand.

MUD-SPLASHING NUISANCE OVERCOME

IT may be because the French women objected to having their beautiful gowns splashed with mud from the wheels of motor cars or because the Frenchman has always been a leader in improving the motor vehicle, at any rate an automobile club of Versailles recently arranged a competition among inventors for the best device to overcome the mud-splashing nuisance.

For testing the various devices a number of large white boards, divided into squares by vertical and horizontal lines, were set up on each side of a previously prepared mud track.

The cars with the fenders attached to the wheels were driven over the course in two directions at a minimum speed of fifteen miles an hour and a record established of the efficiency of the anti-splashing mechanism by the number of squares on the boards splashed as the car passed.

Later an examination was made by the judges to pass on the mechanical construction, ease of attachment, method of cleaning and general appearance of each device.

About half of the fenders entered in the contest were found inefficient and allowed mud to be scattered freely in all directions, while others were mechanically complicated and of crude appearance.

The winning fender consisted of a leather bound brush suspended from the hub cap of the wheel and held in place by two springs and an extension of the frame up to the mud guard of the car to prevent the brush from revolving with the wheel.

The price asked for each device was taken into consideration in determining its availability for general use. Some of the fenders were offered as low as sixteen dollars per set while others were priced as high as one hundred dollars.

THE WINNING MUD FENDER IN THE CONTEST.

SCORE BOARD FOR SHOWING THE SPLASH OF AUTOMOBILE WHEELS EQUIPPED WITH FENDERS IN CONTEST.

ACROSS SEAS IN A SAIL BOAT

ONE of the most extraordinary sea trips ever made by a small sailing craft was made in the *Sea Bird* which was recently exhibited at the Boston

THE *Sea Bird* LEAVING FOR HER TRIP ACROSS THE ATLANTIC.

ROTARY SNOW PLOW AT WORK ON THE MISSOURI PACIFIC NEAR HOISINGTON, KAS.

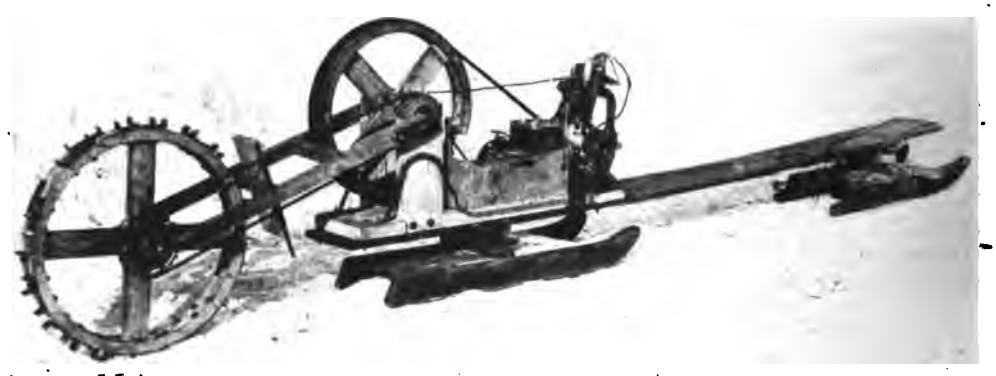
motor boat show. This tiny sailboat not over twenty feet long and having no auxiliary steam or gasoline power sailed from the Rhode Island Yacht Club house with a crew of four men, and two weeks and four days later the little yacht had completed a journey across the Atlantic.

One of the party stated, on his return, that the only inconvenience they suffered was that a can of kerosene on board leaked and flavored every potato they had aboard. They experienced only one storm during the trip and weathered it without incident other than a sleepless night.

The food on board would have lasted for a month and daily observations were taken of latitude and longitude during the voyage and an interesting log made of the entire trip. The little boat was carried over the water on its second trip lashed fast to the back of an ocean greyhound, the occupants who made the trip not wishing to again tempt fate in a trip back.

AUTO-SLED FOR YOUNG FOLKS

ARTHUR JEWETT of Skowhegan, Maine, has recently perfected a double runner motorcycle combination that is an object of envy among the youngsters about town. He removed the engine from the regular motorcycle and mounted it to the rear end of the bob-sled. The engine is bolted to a large pulley on a counter shaft and the latter is connected by sprocket and chain to the driving wheel. The driving wheel is set in the rear end of a movable frame pivoted on the corner shaft; it rises and falls readily to cover all road inequalities.



AUTO SLED FOR YOUNGSTERS INVENTED BY A MAINE MAN.

WRECK OF FIVE LOCOMOTIVES IN PUSHING A SNOW PLOW. Four men were injured.

STEEL CAR PROVES ITS WORTH

SINCE the advent of this new type of carrier, accidents upon the roads which have adopted it have been few, but a recent collision between two electric cars doing duty upon a branch line of one of the large railroads was of such a nature as to give exact knowledge of what might be expected of the all-steel car under such conditions.

Through a misunderstanding of orders the two cars shown in the illustration met at a high rate of speed on a curve. Both cars were filled with passengers. The

VINDICATION OF THE STEEL CAR.
The result of the collision to one car.

motormen jumped, the passengers were somewhat bruised by the shock but none was killed and there was not a bone broken. Beyond the point where the steel structure shows distortion the car frame and roof were found in perfect condition. The damage was confined to the portions of the cars which came in contact in the collision and there was no tendency to telescope as would have been the case with wooden cars.

The pointed ends of the cars locked fast in each other's grip and the wheels did not leave the track.

Evidently the all-steel car has fully proved its right to a place among traveling vehicles. It is about the safest device that man could devise to carry passengers at a high rate of speed over two rails.

A MINIATURE ELECTRIC-LIGHTED STAGE.

DESIGNING COSTUMES FOR THE STAGE

THE art of designing stage costumes is pursued by a New York woman. For the purpose of presenting the costumes for an entire play, after studying the playwright's manuscript, she makes paper-doll manikins, painted and dressed as they will appear in the production. These figures she displays on a miniature electrically lighted stage, with the special scenery designed for the piece.

The miniature stage is an exact reproduction of a real stage, with proscenium, wings, flies, back drop, shifts and cur-

THE RESULT OF THE COLLISION TO THE OTHER CAR.

tain, all on a small scale. The frame work of the stage is of wood, and the scenery is constructed of heavy cardboards and canvas, and is painted with artistic taste. So far the whole thing might be merely a beautiful toy, but the ingenuity and skill used in the lighting of this Lilliputian stage show that it is far more than a toy. There are rows of electric lights over the stage, so arranged that any one row can be extinguished without disturbing the others, thus making it possible to vary the illumination from a soft twilight to the dazzling blaze of sunlight. This also enables part of the stage to be more brightly lighted than the rest.

Just in front of the little curtain is a row of electric footlights, which throw their light directly on to the stage, just as do their prototypes of the real theater. Dry batteries were tried for lighting this miniature theater, but they were not satisfactory, so now storage batteries are used with entire success.

TREE-CLIPPING EXTRAORDINARY

THE queerest use of trees for ornamental purposes is seen in the so-called Italian garden, wherein they are made by skillful clipping to assume all sorts of fantastic forms. The effect produced is grotesque enough, and yet it has a quaint beauty of its own. This garden is to be found at Wellesley, Mass.

The New England of today certainly is not the New England of puritanic times. Imagine such a garden in the straight-laced days that antedated the American Revolution. This new style of tree-clipping is, however, scarcely artistic. It would be well enough for a public pleasure park where an admission charge is made. The designer of this garden evidently had a somewhat warped sense of beauty. Still, despite all this, one must admit the effect is rather pleasing, and certainly unique. At any rate it is a very curious novelty.

AN ITALIAN GARDEN, TO BE FOUND AT WELLESLEY, MASS.
The effect is certainly fantastic, though not without a sort of beauty.

THE TRUMPETER AUTOMATON.

THE YOUNGEST MEXICAN INSURRECTO.

Vincente Galban, only twelve years of age, is one of the front rank in the insurrecto forces. His father was killed in battle, so Master Vincente shouldered arms, and marched along. He is an exceptionally bright boy, has pleasing manners, and is a fine shot. One rather expects him to show a vain air, on account of the notice taken of him on all sides, and the shower of attention and compliments, but he is quite free from affectation, and should he not fall in battle will, no doubt, make his mark in life. He lives not far from the Texas borderline.

TRUMPETER AUTOMATON AND ITS STORY

A FAMOUS automaton of the middle of the last century is a mechanical trumpeter which is still a curiosity of Vienna. When in 1848, after Metternich's overthrow, the court, before the imminent revolution, had flown to Innsbruck, the mob pillaged the houses of well-to-do citizens whom they suspected as being monarchists. Among these was one Leonhard Maelzel, a clever instrument-maker, who in order to cheer his guests, had built an automatic trumpeter attired in a splendid uniform. A clever apparatus caused this automaton to put the trumpet to its mouth and to play a thundering flourish. When the mob threatened his house, Maelzel installed the automaton near the window, and as the mob heard the trumpeter's flourish, they thought there were soldiers hidden in the house, and seized with a sudden panic, rushed on in some other direction. As a matter of fact, the city of Vienna, only a few hours afterwards, was retaken by the Prince of Windischgraetz.

TELEPHONE FOR DEAF MUTES

A DEAF mute of Lynn, Mass., has invented what he calls a "deaf mutes' telephone," to enable them to converse rapidly not only with each other but with those who possess their hearing and speech, without having to use the finger-sign language. The new phone represents the work of a man and his wife, both deaf mutes, assisted by their young son, who is almost blind.

The phone comprises an electric keyboard. It has, like a typewriter, the universal system arrangement of letters. This keyboard is connected by wire with the electric signal board which is

TELEPHONE FOR DEAF MUTES.

OLDEST OF SWANNERIES.

This swannery belonging to Lord Ilchester at Abbotsbury, a little village in Dorsetshire, England, is said to be over eight hundred years old, and there is documentary evidence of its existence in the time of the Tudors. Here may be seen at any time over a thousand graceful white swans.

BUSY MAKING NESTS.

the talking machine proper, consisting of thirty-six incandescent light globes, each painted on the end of the bulb with a large letter of the alphabet or one of the twelve numerals.

The deaf mute who wishes to talk with another person presses the keys in order, spelling out the words as on a typewriter, his vis-a-vis reading off the letters as they flash up on the lamps. The keys come down on to points of contact in the same manner as do the printing typewriter telegraph machines, instead of striking by means of a lever bar as does a typewriter key. This does away with any false or lost motion and ensures perfect contacts. The keyboard, however, can be operated as quickly by an expert as an ordinary typewriter, and the letters can be read as quickly as they can be flashed up. Thus persons familiar with an ordinary universal typewriter keyboard could readily operate the machine, and with a little practice become expert at it.

The inventor has perfected his invention so that two machines may be installed in separate rooms, or in houses some distance apart and the conversation carried on — swiftly and silently — with more speed than on the ordinary phone.

A Congo Gorilla in Captivity.

CONGO GORILLA IN CAPTIVITY

AFTER a nineteen hundred mile trip from Equatorial Africa Prof. Garner recently arrived in New York with the second live specimen of gorilla ever to reach this country. A thousand miles, or so, was covered in going through the gorilla country, traversing Jungles and dense forests before the present specimen was located. It was obtained from a trader in the village of Ningo Sitka on the French Congo, some 150 miles inland. "Mille Ningo," is the name of this little extraordinary creature. She is two feet and a half high and two years old. When full grown she will probably reach five feet in height.

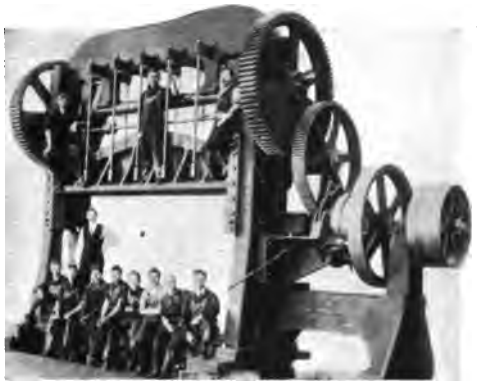
Special quarters, a whole large cage in the Primate House, is given up to her. She refuses to make friends with "Baldy," "Susie" or the other noted chimpanzees from Africa who are in adjoining apartments. No visitor at the Zoological Park has been considered such a treasure and carefully watched and fed as the little Simian lady from the Congo. The zoo chefs have prepared all the most tempting tropical dishes they know of to please the palate of Mille Ningo. Indigestion and lonesomeness seem to be the main trouble. Gorillas are rarely seen in captivity owing to two causes, their capture is difficult and dangerous, and they likewise cannot stand isolation and close confinement as can the chimpanzees and orangs.

The gorilla was first very prominently brought to the attention of Americans by the French explorer, Paul Du Chaillu. About 1855, under the auspices of the Academy of Natural Sciences, Philadelphia, he explored the interior of Africa, making many discoveries.

For Sending Photos by Wireless.
Professor Koern recently installed at Monte Carlo his apparatus for transmitting human likenesses from that famous resort to Paris.

FISHING IN AMERICA'S WONDERLAND.
Cooking a fish without moving from the spot where it was caught in Yellowstone Lake.

HOW TROUT SWARM IN YELLOWSTONE LAKE.
The government lets visitors to the park catch all they want.



GREAT PRESS WHICH FORMS HALF AN AUTOMOBILE BODY AT ONE STROKE.

STAMPING OUT AUTOS

NOT exactly stamping out the whole auto but stamping out one half of the body at each stroke of the press is the latest method of a manufacturer.

Automobile bodies have been made of metal for a number of years, but usually of plates representing only a small part of the body which was attached to other plates by rivets or screws and the whole built over a wooden frame. As the demand for cars has increased, some more rapid method had to be devised and the great press shown in the illustration is the result of the cudgeling of the inventor's brains.

The machine is so large that a special building had to be constructed to house it and it weighs 1,500 tons or 300,000 pounds—most certainly a ponderous apparatus.

The base of the press on which are placed the dies for forming the bodies measures twelve feet in length by four feet in width and each die used weighs many tons.

After the bodies are formed the two steel halves are welded together by electricity and so perfect is the work that the seam where the weld is made is hardly visible.

Bodies for the highest priced cars are made in this manner and it not only enables the car builders to turn out more cars but at a much lower cost than by the older and slower method.

FROG POSES AS MODEL

ON the left of the operator is a live frog. He is sitting very still. It is necessary that he should do so in order to serve as a model for the magnified frog which is being sculptured.

It will be noticed that the magnified frog has his mouth wide open. Hence it is requisite, from time to time, to pry open the mouth of the real frog and see what it looks like inside. When the enlarged frog is finished, being duly painted green and yellow, with suitable spots and a white stomach, it will be remarkably realistic.

COURTESY AM. MUSEUM NATURAL HISTORY, N. Y.

BIGGEST OF ALL BULLFROGS.

The frog keeps his eye upon the sculptor. He takes life easily. He is not worrying evidently about the trials of the professional model. He is a "homey," tractable sort of a little creature, and seems to realize the importance of being as quiet and of giving as little trouble as possible.

UNUSUAL TYPE OF BRIDGE.

It spans the Charles River between Boston and Cambridge. The draw is of the trunnion type, is operated by electricity, and requires only thirty seconds to open. The counterweight at the rear weighs 110 tons.

NEW AEROPLANE, RECENTLY TRIED OUT IN FRANCE, THAT HAS THE MERIT OF BEING CAPABLE OF BEING STEERED BACKWARD.

AEROPLANE THAT STEERS BACKWARD

THE French, who are, seemingly, at least, if not actually, experimenting with the aeroplane more generally than the people of any other nation, have now brought forth for the inspection of the world a machine that boasts a feature no previous aeroplane possessed, at any event, in a satisfactory degree: the aeronaut may steer the new machine backward as well as forward. This aeroplane was first shown at Ivisy, the scene of numerous aviation meets. It is of the monoplane type and has been christened the "Sylphe," either out of poetic fancy or because it really does maneuver with unusual freedom and grace of motion.

ADVERTISING THE PANAMA-PACIFIC EXPOSITION, 1915.

OVERLAND BY DEER TEAM

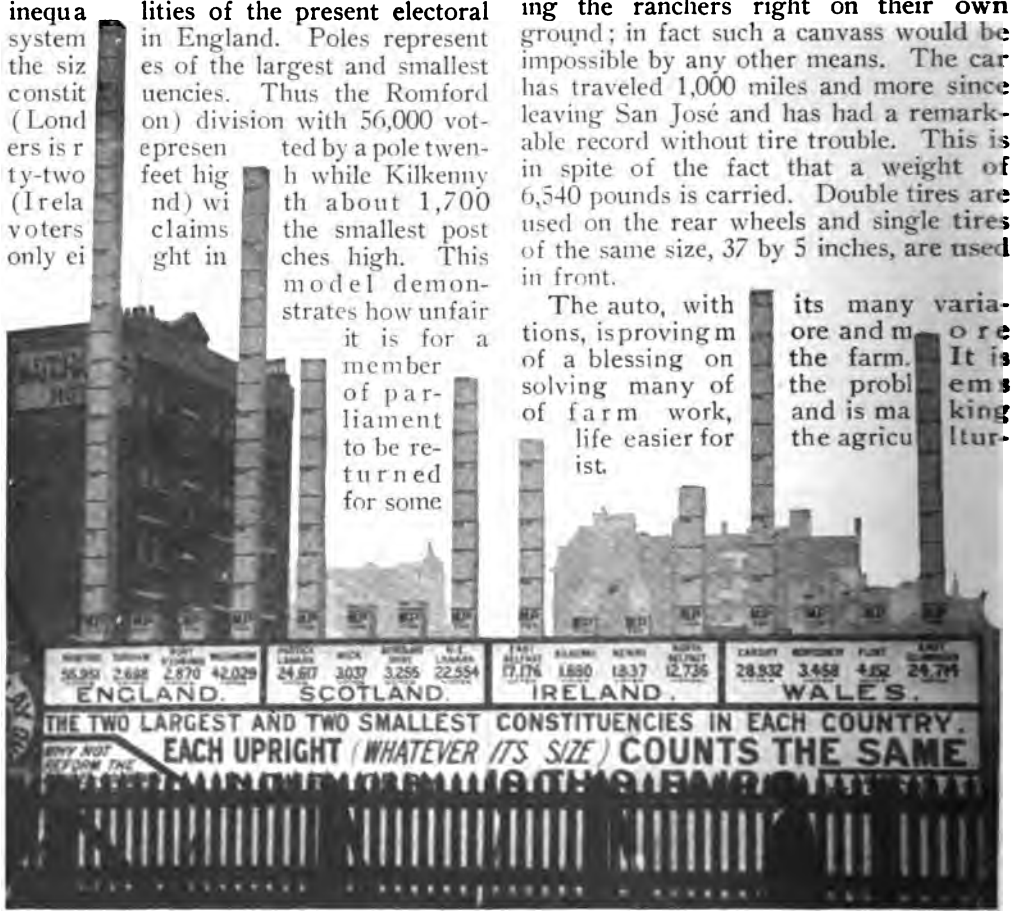
PROBABLY the most remarkable trip across the country ever attempted is now being tried out by Frank Clemens, who is driving from San Francisco to New York behind a team of trained deer. The vehicle to which they are attached is of unique design, combining lightness with strength, and is built of bicycle frame tubing, while the wheels and seat are of the same type. Mr. Clemens expects to make the trip in three months and will represent the Panama-Pacific Exposition en route.

POLITICAL LESSONS IN A MODEL

IN the large deserted space of ground in the strand owned by the London

MOTOR CAR AS SPRAYING OUTFIT.

county council there stands a model of a remarkable nature. It demonstrates the inequa lities of the present electoral system in England. Poles represent the siz es of the largest and smallest constit uencies. Thus the Romford (Lond on) division with 56,000 vot- ers is r epresen ted by a pole twen- ty-two feet hig h while Kilkenny (Irela nd) wi th about 1,700 voters claims the smallest post only ei ches high. This ght in model demon- strates how unfair it is for a member of par- liament to be re- turned for some constituency representing a thousand voters while another member has a following of many thousands but each man has exactly the same powers, in the house of commons as a representative of the people.



MODEL SET UP BY ENGLISH POLITICAL REFORMERS TO SHOW UNFAIRNESS OF PRESENT BASIS OF REPRESENTATION IN PARLIAMENT.

MOTOR CAR AS SPRAYING OUTFIT

CARRYING a number of spraying pumps, tanks and a couple of stationary gas engines, a fifty horsepower car is traveling up and down the state of California and demonstrating to fruit growers just what can be accomplished in the destruction of scale and other pests by means of its outfit and chemicals. The automobile is of the greatest possible service in reaching orchards and interesting the ranchers right on their own ground; in fact such a canvass would be impossible by any other means. The car has traveled 1,000 miles and more since leaving San José and has had a remarkable record without tire trouble. This is in spite of the fact that a weight of 6,540 pounds is carried. Double tires are used on the rear wheels and single tires of the same size, 37 by 5 inches, are used in front.

The auto, with its many variations, is proving more and more of a blessing on the farm. It is solving many of the problems of farm work, and is making life easier for the agriculturist.

THE MEN WHO MAKE THE MAGAZINE

ROBERT H. MOULTON'S name is very familiar to TECHNICAL WORLD MAGAZINE readers. Nearly ever issue contains something from his pen. Aside from his writings Mr. Moulton is remarkable for another thing: he is probably the only deaf man that ever graduated from a college for hearing people. He is a product of Columbia University's school of architecture, but did not find the actual work of his profession to his liking. In spite of his physical defect, Mr. Moulton is a keen and accurate investigator. He is a lip-reader, and a pencil and paper readily supplement the spoken word, whenever necessary, though these auxiliaries are seldom needed.

ROBERT H. MOULTON.

GEORGE H. CUSHING.

GEORGE H. CUSHING is an authority on all things that pertain to coal—with reference to mining, and the business and labor ends of the industry. His researches have not ended here, however. He is an investigator into the extensive field of industrial economics. No one who has read one of his articles can soon forget it.

Mr. Cushing is an editor as well as writer, being chief of staff of an important trade journal that deals with the coal industry. His means of recreation is a somewhat curious one—by many indeed, considered hard work. It is writing fiction.

CHARLES FREDERICK CARTER—with his brisk, racy style, his versatility, and his technical accuracy—has shown himself to be above the usual. While his specialty is the railroad field,—he has published authoritative works in this line—he has a broad training and quickness of mind that enables him to enter with marked success into numerous other realms.

Mr. Carter has lived a varied career. In his time he has been farmer, brakeman and teacher, and has served on the editorial staffs of two Chicago, three New York City, one Brooklyn and one Denver newspaper. He is a busy, energetic man who works

CHARLES FREDERICK CARTER.

WALTER V. WOEHLKE.

with tremendous vim, throwing his whole being into whatever task he may have in hand.

He likes to look at the things of life from the point of view of the man of affairs.

WALTER V. WOEHLKE can handle his theme in a vigorous and brilliant manner. His writings are picturesque and striking. His article in this month's TECHNICAL WORLD — "Grabbing the West's Liquid Fuel," is one of the best published in a long time. Mr. Woehlke knows his subjects thoroughly and speaks boldly. He is a Californian.

F. G. MOORHEAD, WHOSE WRITINGS INSTRUCT AND ENTERTAIN OUR TENS OF THOUSANDS OF READERS EVERY MONTH.
Mr. Moorhead's specialty lies in the agricultural field.

The Tilted Wall

by C. L. Edholm

THREE years ago a young attorney in Chicago was about to build a little summer cottage on one of the northern lakes, and a good friend of his who was in the business of selling cement by the barrel or carload, got wind of the fact and camped on the lawyer's trail. Every time the attorney would step out of his office to get a cigar or to go to lunch he would be likely to run across his friend, the cement salesman, who would quite naturally bring the conversation around to fireproof construction, the durable qualities of cement, its cheapness and so forth. The attorney took it good naturedly enough, for he admired the persistency that sticks, but finally he was moved to retort, something like this: "Now, look here, Blank, you know these little summer cottages are just made up of a single wall of wood; that's all. Am I right?"

"Quite right, and they are the worst fire traps—"

"Yes, I know, but here you are trying to persuade me to put up two walls of wood and throw them both away to get one of concrete. Why not use that wood to build two cottages?"

This was a facer for the cement salesman, who grasped the idea that reference was made to the wooden concrete forms, but he had the answer ready.

"Oh well, if you are so darn stingy about your old lumber, why don't you pour your concrete walls flat on the ground and tilt 'em up on edge when they are hardened."

That seemed like an ingenious idea though a highly impracticable one and the young attorney was prompted to inquire whether anybody had ever tried such a wild scheme.

"Why sure, there is a man up at Camp Logan who is building walls that way right now."

"Oh yes, I suppose he operates with ten foot slabs and bolts them together."

"Not much, he is putting up one hundred and forty foot walls."

That little conversation meant a good deal more than the sale of enough cement to build a summer cottage. The attorney was so interested that the two of them took the train for Camp Logan that afternoon and watched one of those one hundred and forty foot walls being tilted into an upright position by a series of jacks, and the sight impressed the prospective builder so much that he eventually quit his law practice to help form the corporation which controls the patents. For at that time there were patents but no system, just an experiment being carried out by one of the rare inventive geniuses who meets new difficulties with new methods of doing the work. The inventor and contractor, who was building a rifle range at Camp Logan, was Col. R. H. Aiken, and he told the young lawyer an interesting little story of how he was forced into the idea of the tilted wall. Colonel Aiken, an expert marksman and designer of the Standard targets now in use in the United States Army, had been given the contract to build this rifle range for the Illinois Na-

A DEVICE WHICH GOT A CONTRACTOR OUT OF A BAD FINANCIAL HOLE.
Raising on jacks a section, 140 feet long, of a concrete rifle range, at Camp Logan, Ill.

tional Guard. It consisted of a concrete wall, three-quarters of a mile long, about six inches thick, twelve feet high and backed with earth. Every one hundred and forty feet was a little "marker's" house, where target supplies were stored. These houses were also to be of concrete.

Now at that time the colonel was a better marksman and constructive genius than contractor, and when he came to figure on his expenditures he found that he was going to lose heavily on the contract. He had not reckoned closely enough on the high price of the wooden forms. Rather than do his work at a loss, the colonel put in some hard thinking, and the idea came, "Why not mould these rough walls in shallow trenches on the ground and lift them into place?"

The plan was tried out, a section at a time. All kinds of devices were used to raise the lengths into place after the concrete had set; derricks, cranes and jacks operated by hand power. Every step taken led to another in the right direction. The three-quarter mile wall was completed without the anticipated loss, practically no lumber being used.

Then came the time to construct the little marker's houses and instead of setting up forms for them, Colonel Aiken decided to try out his system on the simple walls of the sheds. The openings for the doors and windows were laid out, but before the pouring of the concrete was done the new idea had sprouted, "Why not set in the door and window frames and let the cement harden around them?" That was tried out with complete success. The walls of the little houses were raised and the corners locked by a method that was simple yet effective: the reinforcing material was allowed to project a few inches at the corners and, when in an upright position, moulds were set up at the junction of the walls and concrete was poured in, binding them perfectly. Thus, still more economy had been effected, and the little sprout of an idea had begun to develop into quite a promising plantlet.

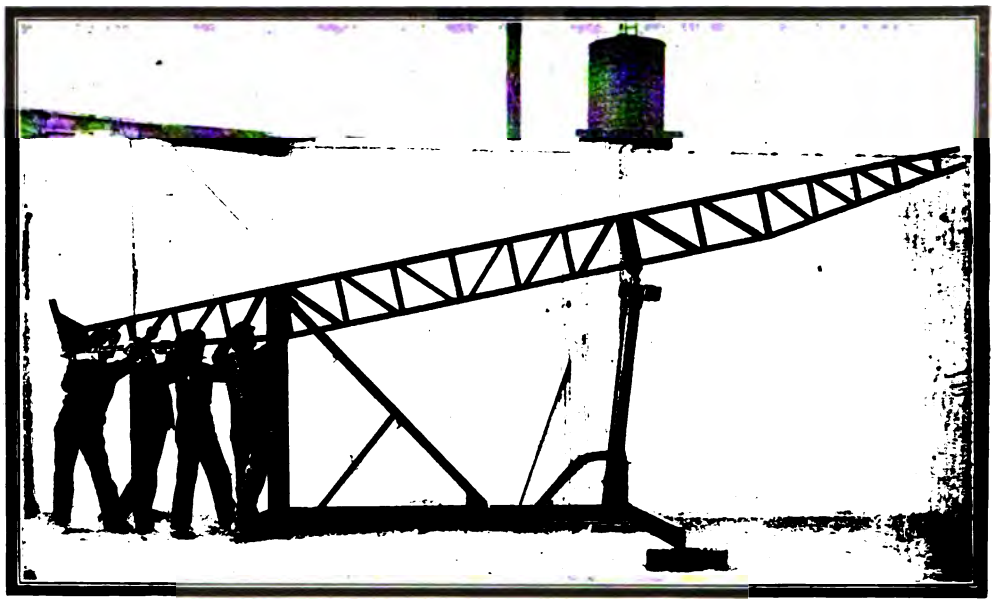
When it came time to build the barracks at Camp Logan, a contract which the colonel had secured, it was decided to experiment still further and the new difficulties were overcome as they arose

until the present system was evolved, which is now in use by the Federal Government as well as in large private contracts all over the country. The apparatus in use at present consists of a series of latticed beams formed of angle iron, which stand about four or five feet above the ground on temporary foundations and work up and down on a pivot. Each beam is equipped with a telescope screw which is just of sufficient length to raise the frame to a vertical position. These beams are set along the inner side of the permanent foundation at intervals of about six feet or more, according to the proposed thickness of the wall. They are not perfectly horizontal but lie at an angle of about ten degrees. The wooden form for the wall is bolted upon them. You see, in perfecting the system, the lumber which brought forth the idea could not be altogether dispensed with, but as the form is built like a flat, shallow box, open at the top, only a little more than half the usual amount is required. Better still, that half is not nailed together by skilled carpenters but rapidly bolted in place by men who are not necessarily expert wielders of the saw and hammer. Best of all this lumber is not ripped to pieces and thrown away when the wall is up, but merely unbolted, fit to use again and again.

Having built the shallow box, set in the door and window frames and arranged for whatever ornament the façade is to have, the concrete is thoroughly tamped in about the reinforcement. Here is one of the greatest advantages of the system, as the pourers can readily fill every part of the form, while in an upright mould it would be comparatively easy for voids to remain.

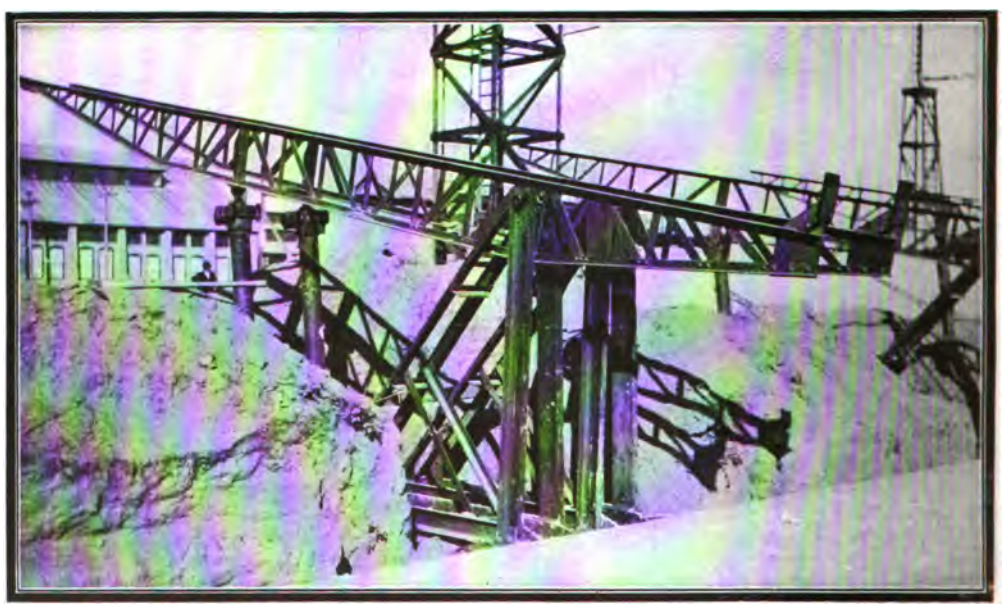
Where the architect's plan calls for pilasters, ornamental capitals and decorative cornices or friezes, these are allowed for. The highly decorative work is moulded separately and set in place,

BUILDING A LOW-PRICED FARM-HOUSE.
Studding ready for the laths is set in the concrete. These walls were moulded on the ground.



THE JACK AND THE BENCH ARE EASILY PUT TOGETHER.
They are essential factors in raising the tilted wall.

the iron reinforcing rods in the ornaments being allowed to project into the forms so that the concrete wall is tamped right around them. Then, while the surface of the wall is still wet, a finishing coat can be applied and this is highly advantageous. It is a well known fact that it is difficult to join fresh cement to that which is set and as the ordinary forms leave board marks, which must be



BEAMS READY TO RECEIVE THE CONCRETE FORMS.

THE RAISING OF A CHURCH WALL BUILT WITH AN APSE, OR PROJECTING PART, IS A MOST DIFFICULT FEAT.

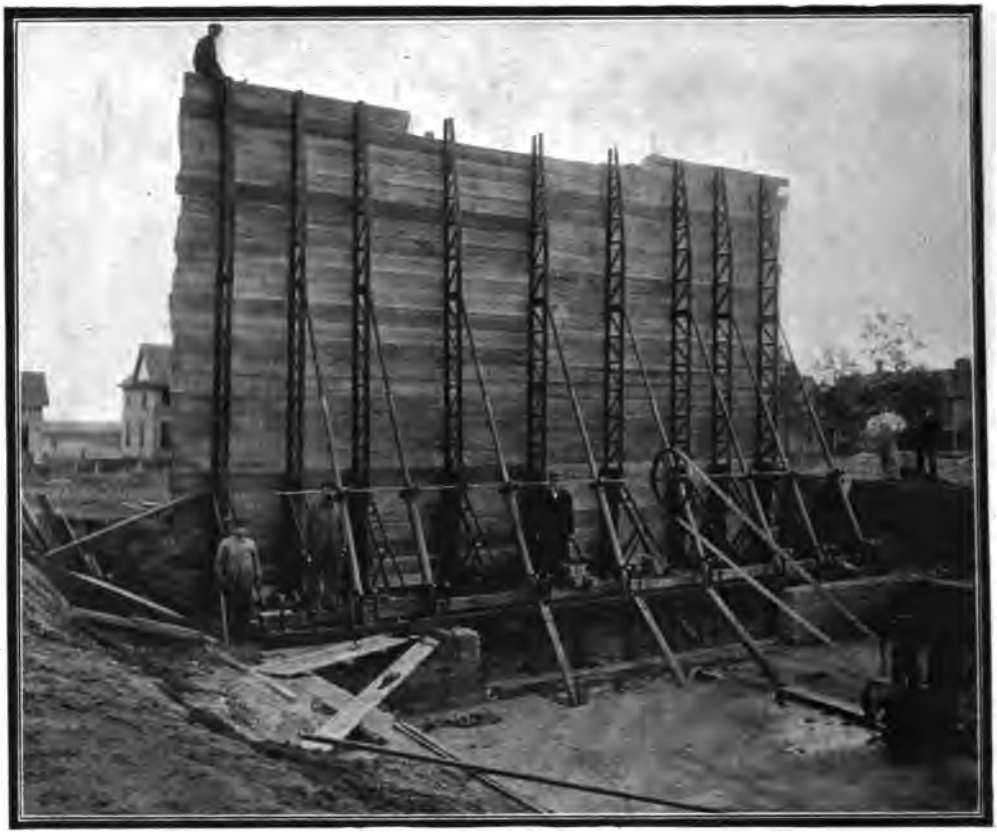
covered with a cement finish after the concrete is hard enough to remove the forms, the result is often a surface which cracks and scales. By applying the finishing coat before the cement in the body of the wall is set the difficulty is overcome, as surface and wall become one piece. Various surfaces can be applied, of course, one of the most ingenious methods of producing an artistic finish being by this method: a piece of old Brussels carpet is laid on the wet surface and immediately ripped off, leaving a semi-rough or stipple effect.

After the last touches are applied, the wall is allowed to harden and, as the upper surface is exposed to the air, this does not take long. Within five or six days the wall is set and ready to be tilted into an upright position on its foundations.

The power for raising the wall is supplied by a small engine, a gasoline or steam engine of six horse-power being sufficient. The telescope screws are turned by a worm gear, and as a shaft runs the entire length of the wall, connecting with each jack, the lift of each is exactly the same. This shaft makes 104 revolutions for every inch that it raises, so that the motion is very gradual and gentle.

The worm gear engages a telescope screw jack under each bench, the outer screw having a diameter of three and three-quarters inches and the inner one two and three-quarters.

Although the system has been in use for only a few years, many improvements have been made and many difficult feats attempted. One of the most remarkable exhibitions of skillful construction was the building of a church, the rear wall of which included a large curving apse. At first glance it would seem extremely hazardous if not impossible to tilt a wall with an eight foot bow in the middle of it, but it was a thorough success. An arch of scaffolding was built upon a platform in the center of the regular wall form and the concrete tamped in place. Windows had been allowed for in the apse and these were boarded on the outside and guy wires were run from these boards to the benches in order to give greater rigidity to the apse while it was



CHURCH WALL WITH APSE IN PLACE.

being tilted. In order to prevent the pull of this mass from uprooting the jacks bodily, they were securely anchored to a "dead man."

Another problem solved in connection with this system is the making of hollow walls of concrete. The necessity for the hollow walls in the severe cold of winter was demonstrated by a church which was built with a heavy solid wall of concrete. This was erroneously thought to be a sufficient non-conductor but the architects discovered their mistake when it was too late. The inner wall had been plastered, and elaborate and costly mural decorations had been applied to the interior, and when the church was heated for Sunday services the first real cold day of winter little streams of water ran down to walls, ruining the artist's work. The explanation was simple: the moisture contained in the heated air was condensed the moment it struck the cold wall of the church and a liberal dew was precipitated upon the mural paintings.

The problem of obviating such difficulties by use of his system gave Colonel Aiken much food for thought. It was not practicable to make wooden forms to hold the inner and outer walls apart, as the lumber could not be removed, and if allowed to remain it would swell in wet weather and crack the cement. He had the fleeting idea of using tapering forms of sheet iron, which could be drawn out when the concrete hardened, but one day when going through his foundry he noticed the core makers preparing cores of sand, and the problem was solved. In preparing a hollow wall at present, the inner surface is poured first, together with concrete ribs for studding, which run up and down; then a thickness of dry sand is spread upon this to the required depth, flush with the studding, and the outer wall is poured on top of that.

THE MOST ELABORATE ORNAMENTS CAN BE APPLIED IN AN ECONOMICAL MANNER.

When the cement has set and the wall is being tilted upright the dry sand simply runs out, leaving the dead air space which is not a conductor of heat or cold.

So much for the utility of the system. From the aesthetic standpoint quite as much has been accomplished, as it has been demonstrated that an inexpensive factory building can be made as handsome as an art museum or an exposition hall. The most elaborate ornaments can be applied in an economical manner. The method of preparing the cement ornaments is very ingenious. First a model is made in clay from the artist's sketch. We will suppose it to be a decorative frieze to extend the length of the building. From this clay model a plaster-paris cast is taken and from the latter is made a gelatine mould, which hardens to a rubber-like consistency. When this is stripped off, cement can be poured into the gelatine which retains every detail of the original clay model. As soon as the cement is hard enough the gelatine can be taken off and used again and again until all the sections of the frieze have been completed. If the gelatine mould shows wear after a number of pourings, a new one can be easily prepared.

All these ornamental details are reinforced with projecting rods, and when the façade of the building is to be poured, the frieze, capitals, etc., are placed on the form before the pouring; the reinforcements holding them in place.

ARTISTIC HOME BUILT ON THE TILTED WALL SYSTEM.

COATING IRON PIPE BY MEANS OF A CEMENT GUN.

CEMENT PROTECTS IRON PIPE

A LAYER of cement is applied to iron water pipe in order to preserve it from injurious effects of moisture and chemicals in the soil. The method is shown in the accompanying photographs, which give a good idea of the process. First the pipes are enclosed in a web of fencing wire, which causes the cement to adhere firmly to the surface. Then the cement is applied to a thickness of about an inch by means of a cement gun, an apparatus that blows a spray of water and a mixture of sand and cement, the ingredients combining at the nozzle and striking the surface of the pipe with great force. The result is a very hard protecting surface, which adds greatly to the life of the water or gas main so

THE PIPE IS FIRST PREPARED WITH LIGHT FENCE-WIRE NETTING.

CEREMONIAL MOUSTACHE LIFTERS USED BY THE HAIRY AINU, THE MYSTERIOUS ABORIGINALS OF JAPAN.
These sticks keep clean the flowing beard of one while drinking.

treated. It is claimed that old pipe which has been dug up can be coated with cement by this method and used again, unless, of course, it has deteriorated to a great extent. The two pictures here shown were taken in southern California, where pipes are being prepared for use near San Diego.

The use of concrete in this connection, is another triumph of this material over the ordinary materials that have hitherto held full sway in this sort of construction work. It would seem to sound the doom of the old.

HOW FRESH PICKED CHOCOLATE BEANS ARE HANDLED PREPARATORY TO THE MANUFACTURING PROCESS.
First washed in water, the chocolate beans are allowed to ferment in the sun.

ONE-ARMED ORCHESTRA

THERE is an orchestra in Portland, Oregon, which is composed exclusively of one-armed men. In spite of their physical shortcoming, these determined, enthusiastic young men are making a practical success out of their association.

The idea of this orchestra originated with B. R. Amend, a musician. The loss of his arm did not induce him to despair of somehow making an honorable competence. He set his wits at work and conceived the idea that he could not be the only musician in the world with one arm. He began to scour the city of Portland and the State of Oregon. Ere long, he was in communication with not only one but several who had lost arms and were of musical temperament or training.

AN ORCHESTRA MADE UP EXCLUSIVELY OF ONE-ARMED MEN.

Eight members compose the orchestra, seven with their right arms gone, but the eighth, Mr. Lester Cox, is minus the left. It is a peculiar fact that every member lost his arm through service in the mills of Oregon and Washington!

The orchestra, sensibly, does not go in for classical music, but strives its best to render popular and dance music—the kind the people most appreciate and for which there is ten times the demand. Mr. Amend, handicapped as he is, furnishes a show in himself, as he dexterously and with at times, marvelous skill manages to keep the piano going in time and tune with the instruments about him. It is hard enough to accompany an orchestra when the pianist has two hands and clever musical ability. What must it be when a chap has but one hand with which to manipulate the bass and high keys?

Probably the most difficult and sensational feature of the concerts and entertainments is the stunt performed by Messrs. Amend and Tienken. They give a guitar solo, both playing on one instrument.

ELECTRICAL TOWING AT THE MOUTH OF THE RIVER WESER.

THIS IMPORTANT ELECTRICAL APPARATUS HAS BEEN PUT INTO USE BY THE CITY OF BREMEN.
It shows the pronounced tendency of German municipalities to use new mechanical devices wherever possible.

MILK DELIVERED BY WIRE

THE owner of a small dairy out west got tired carrying the heavy cans of milk from his milking sheds to the creamery, and as the latter building was only about three hundred feet distant and on a lower level he devised the aerial milk carrier shown in the photograph. The full cans are carried above a county road, but as that is on a lower grade than the land on both sides it does not interfere with traffic. The little trolley, carrying a twenty gallon can, is run to the creamery by gravity while the empty cans are hauled back very easily by rope.

MILK DELIVERED BY WIRE.

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Technical World Magazine

HENRY M. HYDE, Editor

Contents for July, 1912

Cover Design—Lejaren Hiller

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Technical World Magazine should be on the news-stands on the 17th of the month preceding the date of issue. Patrons unable to get the magazine on the 17th will confer a favor by notifying the Circulation Manager. News-stand patrons should instruct their News-dealer to reserve their copy of Technical World, otherwise they are likely to find the magazine "sold out."

TERMS: $1.50 a year; 75 cents for six months; 15 cents a copy. Foreign postage, $1.00 additional; Canadian postage, 50 cents additional. Notice of change of address should be given thirty days in advance to avoid missing a number.

TECHNICAL WORLD COMPANY

Home Office: 58th St. and Drexel Avenue, Chicago Eastern Office: 1702 Flatiron Building, New York

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Entered at the Postoffice, Chicago, Ill., as second-class mail matter

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Window Cleaners

These are perhaps half of the subjects about which something interesting is printed in the August Technical World Magazine.

If you read the Technical World Magazine regularly you can keep up to date on everything important that is going on in the world.

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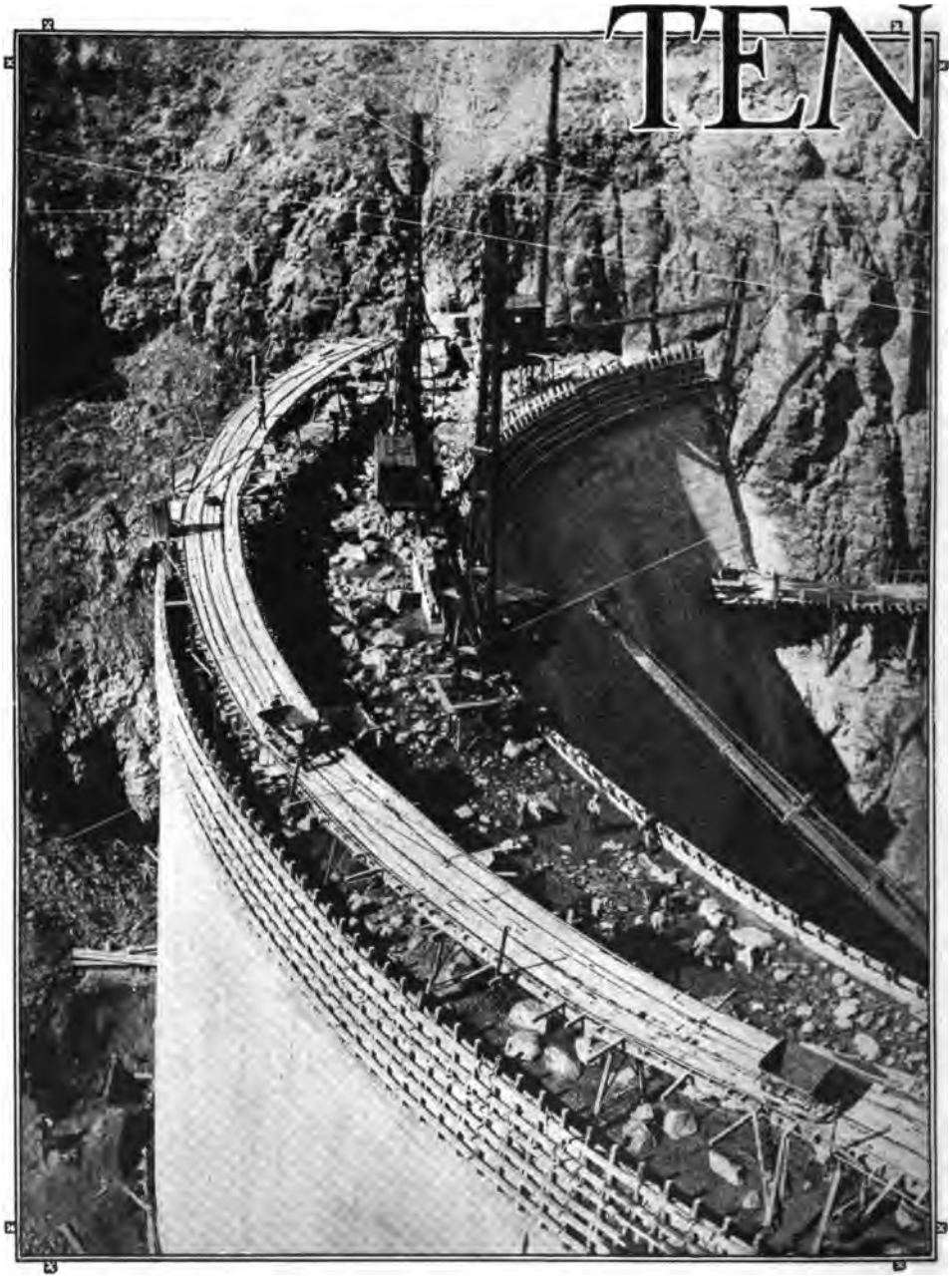
TECHNICAL WORLD MAGAZINE

VOL. XVII · JULY ·1912 · NO.5

IRRIGATION TEN



"TWIN FALLS HAS BEEN ALMOST A TRADE MARK FOR SOUTHERN IDAHO."
Looking down upon the Salmon River irrigation dam, Twin Falls project.

FRAUDS IN STATES

By Randall R. Howard

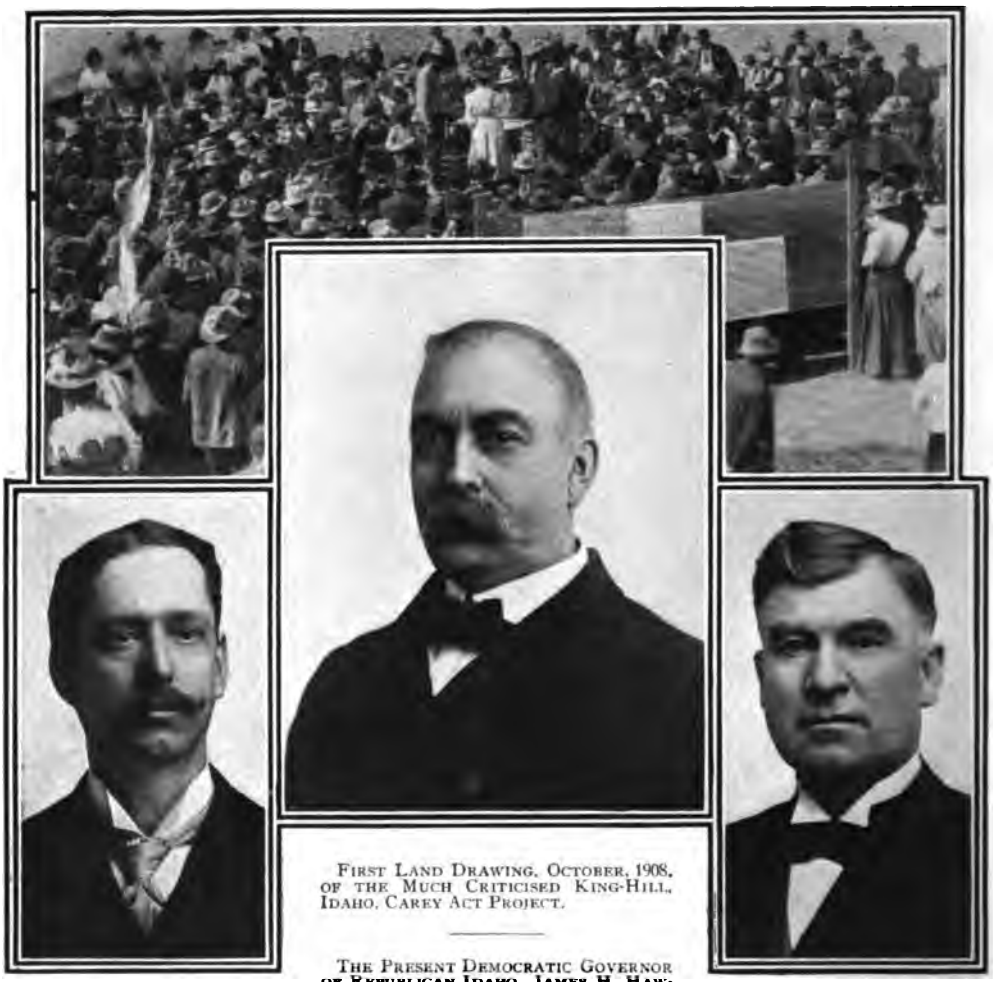
IN the fall of 1908 a physician living in Decatur, Ill., decided to abandon his medical practice and to migrate to the irrigated west. His profession provided a good living, but he had become intensely interested in an Idaho Carey Act project, and he and his wife believed that they had found country freedom and financial independence, a life opportunity. They had implicit faith in Idaho irrigated lands And why not—since the promoters, in their de luxe booklets, reiterated what Dr. K. and his wife already knew: that this Carey Act project was a *State* project. The Idaho State Land Board had investigated it, had guaranteed its water supply, and had fixed its water-right charges. The promoters were merely construction, financial, and colonization agents for the State.

So Dr K gave up his medical practice, and in October filed on forty acres of Southern Idaho Carey Act land.

Last summer, near the end of his third year, Dr. K. could summarize his condition as follows: He had not yet raised a dollar's worth of produce on his "irrigated" ranch. And for a very good reason. He had had no water. Because of the total failure in crops, he and his wife had used up all their surplus capital. They could not leave their State-guaranteed Carey Act farm on which they had staked all their capital and three years of their life. Besides, they couldn't pay their grocery bill. So Dr. K. was doing odd jobs for his neighbors; his wife was courageously helping to keep the wolf from the door by taking in washing.

Another typical resident on the same Idaho project is a young man who came several years ago from the East. He was buoyant and vigorous, and he may have been a little over-ambitious. However, he seemed to be playing safe when he made first payments on a large block of Carey Act land. He contracted to purchase and to make proof on more land than he really intended to keep, because the promoters had fanned the young Easterner's speculative instincts by reciting many examples of the recent mad jumping in irrigated land values. Also, the promoters had reminded him that the project was under strict State supervision; and they promised that his ditches would soon be full of water. So the young man made first payments, and put all his surplus money in substantial land improvements. He planted his crops—then waited month after month for water. No water came. His crops withered and died. He was compelled to haul water for domestic use and for his stock. He obstinately hung on season after season—for three years—but still no water. His second and third annual land payments became due, but he could not pay, because he had raised no crops. He was in danger of losing his land. He could not sell.

One could recount dozens of like examples—homeseekers stranded on the desert awaiting the completion of Idaho Carey Act projects. A few of the projects are practically in a wrecked condition, due to the financial failure of the promoting companies. On others there



FIRST LAND DRAWING, OCTOBER, 1908, OF THE MUCH CRITICISED KING-HILL, IDAHO, CAREY ACT PROJECT.

THE PRESENT DEMOCRATIC GOVERNOR OF REPUBLICAN IDAHO, JAMES H. HAWLEY, WHO, AS CHAMPIONING CAREY ACT REFORMS, DEFEATED JAMES H. BRADY.

FRED FLOED.
As editor of "The Boise Citizen," his vigorous attacks contributed largely to the downfall of the Brady administration.

JAMES H. BRADY.
Under the Brady administration, the promotion of Carey Act projects reached its height in the State of Idaho.

are grave complications in water rights which may delay their completion for years. Still others cannot be financed.

But let us turn to another State. Several scores of settlers, on a single Carey Act project in Oregon, have been waiting more than six years for water. And they are not certain that they will ever get it—even though they have already paid for the water; and regardless of the fact that the Government several years ago granted them title to the land, since State officials had innocently certified that the land had actually been reclaimed.

The promoters of this Oregon project, the old Columbia Southern, found a little creek and a large tract of good land in the central part of the State. Then the promoters went before the old State Land Board, which was supposed to guard the interests of future settlers. The project looked good on paper, and the promoters secured the Board's formal O. K. to a contract. The promoters scattered their circulars to the four winds. The circulars told that the land was being reclaimed under State supervision; and that

the State-guaranteed water rights had been fixed at the extremely low cost of ten dollars an acre.

The selling scheme was well planned, and the promoters soon loaded off water rights for 20,000 acres. The ready sale of the lands may have been partially due to the liberality of the promoters, they assured the settlers—contrary to the Carey Act law—that they could gain title without even coming to the State. But some of the settlers came anyway, freighting their goods more than a hundred miles out from the nearest railroad. Soon, also, the promoters platted a town. The promotion of town sites is usually associated with the construction of Carey Act projects. The town was named Laidlaw, after the chief promoter of the project that was so wonderfully to transform the desert.

F. R. GOODING, FORMER GOVERNOR OF IDAHO.
As chairman of the State Land Board, he began the administration of the Carey Land Act in Idaho.

Everything was booming with the promoters. But unscheduled things now began to happen to the settlers. Their land patents stopped coming from the Government, even though the State Land Board had formally pronounced the land "reclaimed." Still more serious, many of the settlers were unable to get water for irrigation and it was rumored that there wasn't enough water to go around. The settlers became excited, then frenzied. They held an indignation meeting. The chief counsel of the promoting company was present at the meeting, and he answered in an ingenious manner the protests of the settlers.

"We've delivered all the water there is," he replied, in a sympathetic tone, "and we can't help it if the Almighty runs short. The Company can't produce

SALMON RIVER DAM, TWIN FALLS IRRIGATION PROJECT.
Twin Falls is the Mecca of all Idaho irrigation boosters.

MAGNIFICENT PRODUCTS ARE RAISED AT TWIN FALLS.

water," he added, "and if the Tumalow does not contain enough water, then each must take his share and be satisfied."

The State Land Board was aroused to make a belated inquiry into the Columbia Southern Carey Act project. It found that the promoters had contracted to reclaim 27,000 acres of land—the *amount* of water not having been fixed. The promoters had then sold State-guaranteed water rights for 20,000 acres, at ten dollars an acre, to 275 prospective settlers. The total amount of water in Tumalow Creek, on which the project depended, was sufficient to irrigate only 8,000 acres—and approximately one-half of this water was already appropriated by other lands.

The Courts later decided that the Carey Act company was within legal bounds, for it had fulfilled its agreement *to supply water* to the settlers. The project is today about where it was eight years ago. The Company has been reorganized and has attempted to finance a revised plan which will provide a storage reservoir. The

A PORTION OF THE TWIN FALLS PROJECT AS IT LOOKED A FEW YEARS AGO.
Land in this vicinity has sold as high as $1,000 an acre. This fact is one of the choice "arguments" of the land boomer.

settlers are patiently waiting for water—all but the few who happened to arrive first and are now appropriating all the water there is. If the new plan can be financed the settlers must now pay forty-dollars an acre for their water right, instead of the originally agreed-upon ten dollars an acre. If not financed, then the only hope for the settlers is an appeal to the Oregon Legislature, which in the past has seemed little disposed to listen to hard-luck stories.

In Idaho, at the last State election, the

THEY BOUGHT "WATER RIGHTS." BUT THEY DIDN'T EXPECT TO HAVE TO HAUL THE WATER THEMSELVES.
A scene on a Carey Act farm in eastern Oregon.

Carey Act mix-up was enough of a political issue to turn the State inside out, and to overcome a heavy normal Republican majority and to elect a Democratic governer. In Oregon, the Carey Act mix-up is one of the most tangled legal and economic riddles that the officials at the State capitol are trying to puzzle out. And there are other States that also have their Carey Act troubles.

But the Carey Act has not always seen dark days. In fact, many a booster shouted hilariously when Congress passed the Carey Act bill, in 1894. This bill in effect told the Western States that they could each experiment with Carey Act irrigation. The terms of the National Carey Act are simple—and the law has a most ambitious and worthy purpose. In plain terms, Congress granted a full million acres of arid government land to each Western State that would assume the responsibility of reclaiming such a body of land. This reclamation included the subdivision of the grant of land into small tracts that would be sold to actual homeseekers.

Ten of the Western States, as follows, have accepted the offer: Idaho, Wyoming, Colorado, Utah, Montana, Oregon, New Mexico, South Dakota, Nevada and Washington. The steps for gaining State title to these Government lands are simple. Some promoter discovers a possible reclamation project, and he submits a plan for its reclamation to the State Land Board. If the State accepts the project, the plans are in turn submitted by the State officials to the Federal Government. If still favorable, a contract is executed between the State and the United States. By this time the tract has been withdrawn from other entry, and the private company proceeds to reclaim and colonize the land. In colonizing, the promoter is allowed to collect the acreage cost for reclamation which has been made a part of his contract with the State Land Board, this acreage cost incidentally including a profit for the promoter.

Many of the States thought the Carey Act was all receiving and no giving. They figuratively opened their pockets for the irrigation benefits to be poured

THE MILNER RAPIDS IN THE SNAKE RIVER, IDAHO.

BUILDING THE MILNER DAM TO IRRIGATE FARM LANDS.

United States would pass upon the feasibility of all projects, as well as upon the sufficiency of the water available, and whether or not the land had been reclaimed according to the contract."

But one must turn to Idaho, the giant among all the Carey Act States of the West, to study Carey Act irrigation at its heights—also its depths.

in. They didn't seem to realize there were obligations due the thousands of home-seekers that were enticed to the West as a result of this irrigation law. For example, the Oregon Legislature, in 1901, passed a law accepting the terms of the Carey Act. But the cautious legislators provided that the State should be under *no expense whatever,* in carrying out the provisions of the law.

This is the reason why Oregon is today reaping a Carey Act whirlwind. The early Carey Act promoters in Oregon had matters almost their own way, or thought they had. They carried their paper plans to the State Land Board, consisting of the Governor, the Secretary of State, and the State Treasurer, each of whom had a myriad of official and political problems of his own. Nor were there any irrigation specialists in the State House who could be called into conference with the State Land Board. Hence, the State Land Board fell into the easy habit of writing their formal "O. K." on practically all of the representations of the promoters. The State Land Board innocently thought they were doing their whole duty. For in their 1907 report they excuse past mistakes by saying they were "under the impression that the

Carey Act irrigation put Idaho on the map. Before the passage of the Act, Idaho was little but a land of sheep barons, cattle kings, and mining camps. One could travel for days across its plains without seeing even a wire fence. Then came the Carey Act boom, when southern Idaho was perhaps the best advertised, the most exploited section of the entire West. Then the crash of the Carey Act boom, and the dark days following "Blue May." And lastly the Carey Act political reaction, the repenting and the reconstructing present days.

Carey Act promotion in Idaho has always been linked with the most ardent of Western boosting. The boosters verily believed and knew that irrigated Idaho was the modern Garden of Eden. And the boosters are not talking or advertising anything less even today. One of the salaried community publicity men with whom I talked in southern Idaho last summer admitted that there were "a few unfortunate examples of mistakes among Carey Act projects—and some grumbling."

"But," the booster added and correct-

ed, "there have been no more mistakes, and there is no more grumbling, than is usually expected in any business costing so much money."

A little later, one of the big Idaho Carey Act promoters, summarized reasons why immigration into Idaho was only a fraction of what it had been during previous years. These reasons included such far-away ones as "the immigration into Canada; the difficulty of securing loans on Eastern farms; the fact that the greater part of the Carey Act lands had already been sold, hence the projects were being little advertised."

"But," the Carey Act promoter added, with a burst of enthusiasm, "we have some grand Carey Act projects. Have you visited Twin Falls?"

The promoter had said the expected thing, for the great Twin Falls project is the Mecca of all Idaho irrigation boosters. So persistent and well-planned has been the advertising of this project, in fact, that there are thousands of people over the entire earth for whom "Twin Falls" is the hub of the Inland Empire and the Great American West. There are persons who can recite every detail of the wonderful progress and the superexalted hopes of Twin Falls, who have never heard of Boise, the capital of the State, or Spokane, the metropolis of the Inland Northwest.

TOWN OF MILNER, NEAR THE MILNER DAM.

The reclamation of the Idaho desert was a new and a marvelous thing back in 1900 when the Twin Falls project, the fourth Idaho Carey Act project, was first proposed. "Twin Falls" has been almost a trade mark for southern Idaho, and it is said that more than a million dollars have been expended toward indelibly stamping the name on the world's consciousness.

The visitor who has money to invest, or is a prospective settler, is shown irrigation results—a great flat body of land, much of it well-improved and cultivated, which only a few years ago was a wind-swept, dusty, almost worthless, plain. I talked with one newcomer, living a mile or so out from the city limits of Twin Falls, who said his five acres of land had cost him "a little better than $5,000." And from $200 to $400 an acre has not been an exceptional selling price for the irrigated land. But the word is whispered that the project has not been a money maker. The project is perhaps not exceptional in this regard. Indeed, one promoter over in central Oregon went so far as to say to me last summer, "There isn't a single Carey Act project in the West that has made money for the promoters, and the only thing that has saved any of them is their town promotion schemes."

The promoters of the Twin Falls project, figured

IRRIGATION DITCH ON A CAREY ACT PROJECT, NEAR BEND, IN CENTRAL OREGON.

out, back in 1900, according to reports from the State Engineer's office, that they could reclaim the 214,000 acres for $1,500,000. In turn, the Land Board fixed the water right charges for the reclaimed land at twenty-five dollars an acre—which charge should have brought back to the treasury of the promoters the sum of $5,350,000, or a rather tidy paper profit of 357 per cent on the estimated necessary investment. But the engineer's estimates went far awry, for the stated cost of the project to November, 1909, was $3,511,000, reducing the paper construction profit on the investment to only about fifty-two per cent.

THOUSAND SPRINGS, CANYON OF THE SNAKE RIVER, IDAHO.

WILLAMETTE RIVER FALLS, AT OREGON CITY, OREGON.

PART OF THE GREAT SHOSHONE FALLS, IDAHO.

ONE OF THE MANY OREGON WATERFALLS SHOWING THE POSSIBILITY OF A NARROW DAM THAT WOULD CREATE A BIG RESERVOIR.

A number of other promoters of early Idaho Carey Act projects were also caught, the actual cost of construction work sometimes being double or treble the *estimated* cost. In contrast with Oregon's boom example, Carey Act irrigation started off slowly in Idaho. In Oregon, Carey Act irrigation burst upon the State in a flood — some twenty projects totalling 400,000 acres being proposed the first year. But today, more than ten years later, only two of the smallest of these Oregon projects, including less than two-fifths of one per cent of the total land area, have been completed.

But in Idaho there has been a climax, not an anti-climax. Irrigation started slowly. Capital was timid, seemingly afraid of irrigation and the West. It disliked crossing the Missouri River. But the Idaho irrigation pioneers were persistent, and the example Carey Act projects were begun. These projects were advertised, praised, boosted, boomed, rhapsodized, and exploited. Enthusiasm kindled; the Carey

Act idea budded and bloomed. Everybody was a booster, pleased and shouting. Only four Carey Act projects were proposed during the first ten years. But in 1909, twenty-two distinct projects were officially approved by the Idaho State Land Board—projects that proposed to reclaim at a cost of $20,000,000 a total of nearly 700,000 acres, an area greater than the State of Delaware. And the first three months of 1910 were still wild and frenzied days for Idaho Carey Act promoters, the last one of the six projects approved being a bold plan for reclaiming 307,600 acres at a cost of $20,000,000.

Then came "Blue May." The Carey Act bloom was swept away by a frigid wind from the East. An Idaho business man described to me the situation:

"It was during one week in May, 1910, that we realized that we had come to the end of our rope. The irrigation bond brokers of the East had met, had passed the word, had closed their money sacks. Prices of irrigated lands dropped like a rocket. Everybody tried to unload, but there was no unloading. Land that had been a bargain at fifty and one hundred dollars an acre, couldn't raise a bid for the cost of the original filing fees."

"What are you going to do?" was asked. "Isn't Idaho irrigated land as good as gold? Don't you always have good crops? Haven't you almost an ideal climate, the best of soil, plenty of water?"

"Sure. Sure," he replied. "Irrigation is all right. But we've been going a little too fast. We've got to do a little sweating, even though we're keeping on a boosting face for the outsider. But we'll get the money—something like fifty or sixty million dollars, they say—that we need to complete the projects that have been started. We'll get the money some time, because irrigation is all right."

"What about the settlers that are stranded out on the desert waiting for water—and the Carey Act projects that have gone to pieces?"

"Have you been up to the State House, yet?" he in turned asked. "You'll find it's pretty well cleaned out, *now*."

Previous to the last Idaho State election, in which a Democrat was elected Governor, and Republicans to all of the

BLUE LAKE, NEAR PERRINE RANCH, SNAKE RIVER VALLEY.

other chief offices, one of the slogans of the reform Democrat party ran:

"Clean out the State House from cellar to rafters;

"Get rid of the vermin; get rid of the grafters!"

The whole point at issue, according to the reformers, was summarized in bold type in the October 14, 1910, issue of the weekly, "The Boise Citizen." It was told that the administration of the land affairs of the State of Idaho by the State Land Board during the last two gubernatorial terms had been "one of gross incompetency, of indifference to the rights of settlers, of favoritism to promoters and to political henchmen, of negligence bordering on the criminal, of land grabbing and feathering of their own nests by members of the Board to such an extent as to show a contempt for public rights and for public opinion."

Then the reformers began to dig up and to exhibit some plain facts. And these facts seem to have made votes, judging by the later political landslide. The reformers read from the public records that members of the former State Land Board had seemingly been extremely lucky. Their luck was shown in drawing town lots and blocks of land on the opening of the different Carey Act segregations, the openings being under a free lottery system and sanctioned and guarded by the State.

The reformers compiled a list to show, for example, that the following plums had fallen into the lap of one of the former officials: a lot in Gooding, a lot in Buhl, two lots in Jerome, one hundred and twenty acres near Gooding, forty acres near Twin Falls, and two small tracts in Fruitland. Another former official happened to have acquired one hundred and sixty acres in Twin Falls-Oakley, and seven and one-half acres in Fruitland. While a third former official had the following list to his credit: 160 acres near Jerome, 240 acres near Gooding, and one-fourth interest in twenty-two lots in Wendell.

Idaho reformers also charged that only the promoters were represented in the secret Land Board meetings. They charged that former State Land Boards "have accepted the estimates of the cost of an enterprise and the price of water rights to be charged *as made by the promoters,* and this has been done almost without exception."

But the reformers did not deal in generalities. They mixed shot with their political thunder. They cited particular instances of water juggling—how the promoters of the King-Hill Extension project, reported organized quite largely through the efforts of an assistant in the office of the Attorney General, had begun business by purchasing 100 inches of water from the original King-Hill project, regardless of the fact that the main King-Hill ditch would carry only about 130 of 230 inches of water that the King-Hill people needed themselves.

Another of the red-lantern examples of the Idaho reformers related to the old Lost River project, which used to boast the "greatest earthen dam in the world." The dam was much-touted, but the people living below began to fear a second Johnstown flood. The condemnation of the dam left the great project practically in a wrecked condition, even though settlers had already paid to the company cash and notes to the amount of $2,400,000.

Some Carey Act promoters still insist that the Carey Act is "the culmination of irrigation laws." Also, some of the boosters who are trained and paid to see only the one side of a question, still insist that the Carey Act is the greatest present blessing in the West. However, one State engineer with whom I talked frankly expressed the opinion that there was not a single "successful" Carey Act project in the entire West. Yet he would not grant the Carey Act was a failure.

In the old Carey Act boom days, some of the promoters thought they had an endless golden chain. They started with little capital, counting on continued land sales to settlers. The settlers *commenced* to make payments, all right. But after a time the settlers balked, refusing to make further payments until they saw actual water in their own individual ditches. There was a missing link in the golden chain, since, as a rule, irrigation projects must be largely completed before water can be turned on. The promoter had a string of dry, half-finished dams and ditches on his hands. The settlers were stranded on the sun-baked desert.

ON THESE MELON FIELDS MONTREAL IS TO HAVE A MAGNIFICENT SUBURB.

DRILLS AT WORK IN THE "HEADING" OF THE TUNNEL.

TRADING A CITY FOR A TUNNEL

By

HENRY M. HYDE

THIS is the story of a railway, which, facing an expenditure of nearly twenty million dollars for the boring of a tunnel, found a way to make the tunnel pay for its own construction. It is also another chapter in the most amazing record of railroad building ever written across the face of a continent.

The old French Canadian city of Montreal lies on an island, cut off on one side by the sweep of the wide St. Lawrence and on the other, by a beautiful arc of the Ottawa River, called the "Riviere Des Prairies." With a population of nearly four hundred thousand, Montreal is the largest city in the Dominion of Canada. Within the last few years, its growth has been very great and it is now one of the most congested cities on the continent. Not only is the area over which it can spread limited by the natural boundaries of the island, but the island, itself, is bisected north and south by a high and broad mountain, called "Mount Royal"—the name of the city itself being only a corruption of this mountain title.

For years, railways entering Montreal

ONE OF THE FAMOUS MELON PATCHES; AND A TYPICAL OLD FARMHOUSE OF THE MOUNT ROYAL DISTRICT.

have been blocked by this great barrier and forced to creep a long distance about its ends to reach their terminal station. Back of Mount Royal, on the side away from the city, the island runs down to the Riviere Des Prairies in a broad stretch of level, fertile land. For more than one hundred years this land has been owned and tilled by thrifty French habitants, who know the secrets of intensive farming and, on their island acres, brought the famous Montreal muskmelon to its expensive perfection.

Since the coming of the motor car, well-to-do inhabitants of Montreal, seeking a place where they might live away from the crowds and noise of the city, have been buying building sites on the western slope of Mount Royal, looking down over the melon farms.

All that prevented a great and flourishing suburb was the fact that it was necessary to travel so many miles around one or the other end of the mountain to reach the site.

More than two years ago, Sir William Mackenzie and Sir Donald Mann—the two creative geniuses, who, for fifteen years, have been adding to the Canadian Northern Railway at an average rate of a mile a day—decided that it was time for them to consider the matter of securing first-class terminal facilities in the greatest city of the Dominion. To direct and downright men who are in the habit of going straight to the point, the idea of tunneling a great bore through the four-mile base of Mount Royal immediately suggested itself. Other railway men had considered the same plan before. The engineering difficulties were not great, but the matter of cost had always been prohibitive. The constructive imagination found a safe way out. Put the northern slopes of Mount Royal and the level land beyond within six minutes of the heart of Montreal and nothing could prevent the extension of the city in that direction. Real estate values on the other side of the mountain would be multiplied twenty-fold. Enough profit might be made to largely pay for the building of the tunnel and the purchase of terminal facilities in the heart of the old city.

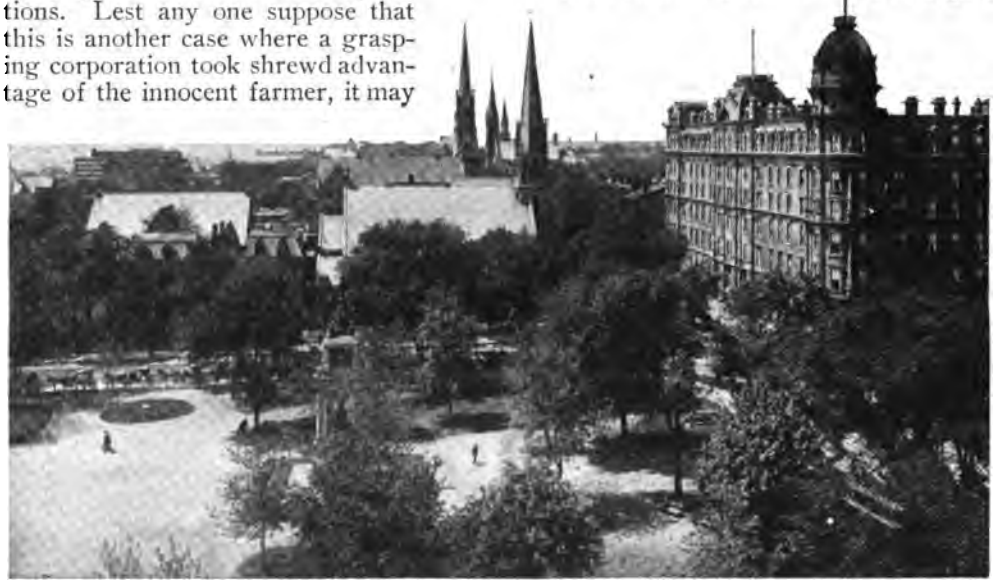
ENGINEER S. P. BROWN.
His word is law on the Mount Royal tunnel. He built the Pennsylvania cross-town tunnels in New York City.

The two knights who won their spurs by throwing steel

rails across the wilderness called in Colonel A. D. Davidson to aid them. Davidson is the father of the American invasion of Canada, canny and wise in all matters of real estate. One of his trusted lieutenants is Thomas Darling, who speaks habitant French like a native. Back on the other side of Mount Royal went Mr. Darling, visiting one after the other of the habitant farmers and securing from each an option on his holdings of fertile, melon land. Sturdy, simple minded, conscientious folk are these habitants, slow to move and cautious in all of their dealings with strangers. It took a diplomat to handle them, but once Jean Francois had given his word, Mr. Darling knew that he could rely on it. It took almost two years to get all the desired land under option. Then, one day, a few months ago, Mr. Darling put more than a million and a half dollars in cash into a hand satchel and went back over the mountain again to pay for the farms he had agreed to buy. Other interests were in the field, and to have checks flying around in the number and for the amounts that would have been necessary never would have done at all. The currency was relatively a small part of the amount required to carry out the general plan, but it was large enough to be unique in surburban land operations. Lest any one suppose that this is another case where a grasping corporation took shrewd advantage of the innocent farmer, it may be as well to state that practically all of the habitants of Mount Royal will be able to retire and live at their ease hereafter on the income derived from the sale of their melon patches. One man, for instance, was paid $117,000 for his comparatively few acres. The largest farm of all brought nearly $800,000.

Plans have been prepared for an unique, model city, which is to be built on the purchased farms. All the business houses will be confined to four streets which run diagonally across the site from corner to corner. There are restrictions which forbid the building of apartment houses and no house to cost less than three thousand dollars will be permitted.

With this great project out of the way, the actual work of boring the tunnel through Mount Royal was begun on May 1st; a great gang of "hard-rock men" starting in at the same time on either side of the mountain. The stone removed from the western opening will be used in grading and paving the streets of the new city of Mount Royal and also in ballasting Canadian Northern lines. The debris taken from the eastern end of the tunnel will be utilized in building an elevated embankment, over which the tracks of the Canadian Northern will run straight



OPPOSITE THIS SQUARE IN THE HEART OF MONTREAL THE RAILWAY WILL HAVE ITS EASTERN TRANSCONTINENTAL TERMINAL.

TUNNEL CONSTRUCTION SHOWING SPECIAL GIRDERS TO PROTECT THE TUNNEL DURING FURTHER BUILDING OPERATIONS.

through the city of Montreal to the banks of the St. Lawrence, where they will join the tracks of the Montreal Harbor Commission.

In its size and equipment, the Mount Royal tunnel will be very much like the Pennsylvania tube under Manhattan Island. Trains will be operated in the tunnel by electricity, and are expected to run at the rate of fifty miles an hour. The work of construction is in charge of S. P. Brown, the young engineer who directed the Pennsylvania cross-town construction in New York. The work begun at both ends, nearly two months ago, will be pushed night and day until the two bores meet in the heart of the mountain. It is estimated that fifteen hundred men will be at work for eighteen months.

Meanwhile, on the slopes to the west, the town of Mount Royal is already beginning to rise. Like water long penned behind a dam, the people of Montreal will rush through to fill it as soon as the way is made. It is planned that the new town shall be organized under the Des Moines commission plan of government, and in its construction advantage will be taken of every improvement which modern methods can suggest.

Lying between the site of the new town and Mount Royal and the Riviere Des Prairies, there is still a considerable tract of land. The projectors of the great Georgian Bay Canal project, who hope to carry the wheat of western Canada through a short loop to the Atlantic are planning to use this river as a link in their chain. That will mean the building of great docks, warehouses, elevators and railway terminals along its banks.

Altogether, this great railroad project means a new era of expansion and prosperity for Montreal. The most remarkable fact about it is that so far as the railroad is concerned, the whole tremendous undertaking will practically pay for itself.

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GERONIMO, THE APACHE CHIEF, SKINNING THE LAST BUFFALO KILLED IN OKLAHOMA.

LAST EFFORT TO SAVE THE BISON

By

P. HARVEY MIDDLETON

IN a letter to Prof. William T. Hornaday, dated September 21, 1887, Colonel I. R. Dodge gives some information as to the almost incredible mass of bison he had met with near Fort Larned, on the Arkansas River, in 1872. "The great herd on the Arkansas through which I passed could not have averaged, at best, over fifteen or twenty individuals to the acre, but was, from my own observation, not less than twenty-five miles wide, and from reports of hunters and others it was about five days in passing a given point, or not less than fifty miles deep. From the top of Pawnee Rock I could see from six to ten miles in almost every direction. This whole vast space was covered with buffalo, looking at a distance like one compact mass, the visual angle not permitting the ground to be seen. I have seen such a sight a great number of times, but never on so large a scale." In a report of the Smithsonian Institute Professor Hornaday estimates that "the actual number of buffalo seen on that day by Colonel Dodge was about 480,000, not counting the additional number taken in at the view from the top of Pawnee Rock, which would bring the total up to a round half million. If the advancing multitude had been at all points fifty miles in

length—as it was known to have been in some places at least—by twenty-five miles in width, and still averaged fifteen head to the acre of ground, it would have contained the enormous number of twelve million head. But, judging from the general principles governing such migrations, it is almost certain that the moving mass advanced in the shape of a wedge, which would make it necessary to deduct about two-thirds from the grand total, which would leave four million as our estimate of the actual number of buffaloes in this great herd, which I believe is more likely to be below the truth than above it."

It seems difficult to realize that of the millions that once roamed our plains, there are today less than one thousand pure-blooded American buffaloes, a mere handful of an animal it was thought impossible to exterminate, and one which the Indian firmly believed issued from the earth continually, and was therefore inexhaustible. Yet today the death of a buffalo is such an important event that it is immediately telegraphed all over the country. It was only about twenty-five years ago that the buffalo's extinction was first predicted, and since that time dozens of attempts to pass legislation to protect the buffalo have failed. It is true that the Federal Government maintains a small herd in Yellowstone Park, but it is not multiplying rapidly enough to ensure the propagation of the buffalo with any certainty; and the only hope for the permanent preservation of the American bison lies in the united effort of the authorities at Washington with the various private owners of buffalo in the West.

No man living has done more to save the buffalo from utter extinction than Major Gordon W. Lillie, the white chief of the Pawnee Indians, who maintains the largest herd of pure-blooded buffaloes in existence at his great ranch outside Pawnee, Oklahoma. Not long ago the Major was instrumental in the preparation of a bill introduced in Congress asking that immediate steps be taken to perpetuate this purely American animal. "When it is known," he said to the writer recently, "that only twenty per cent of the existing buffalo are cows, and that a buffalo cow calves only every two years, the difficulty to be contended with in present day perpetuation is only too apparent. The bill we prepared carried with it an appropriation for the purchase of pure-blooded buffalo, the purchasing of a great ranch far removed from civilization, the fencing of same, and an appropriation for its maintenance.

"Buffalo will not thrive when surrounded by civilization. They multiply better when turned out winter and summer alike, as Nature intended they should be. A buffalo calf will survive a blizzard that would mean death to the toughest of ranch cattle, and buffalo will find food in the deepest snow, through which ranch cattle would not be able to move.

"It is my intention to donate my herd of pure-blooded buffalo to the Government, and, from my experience with buffalo on my ranch at Pawnee, Okla., I am convinced that by assembling all the majority of pure-blooded buffalo that their propagation can be secured and the total extinction of the American bison prevented."

Regarding the present value of the buffalo to cattle growers, it has been known for over two hundred years that the buffalo herds contentedly with domestic cattle, and crosses readily with them.

Under present conditions the stockman simply stakes his cattle against the winter elements and takes his chance on the results, which are governed by circumstances wholly beyond his control.

ON THE BUFEALO RANCH OF MAJOR GORDON W. LILLIE AT PAWNEE, OKLAHOMA.

HEALTH FOR THE CHILDREN

HE had had both yellow fever and cholera, and that fact was to be taken into account in considering his qualifications for the position of Sanitary Commissioner of Chicago when Dr. George B. Young received his appointment to that office from Mayor Harrison. On grounds other than that, however, the Mayor would be regarded as having made a wise appointment, for his talents and tastes and training—personal, professional and administrative—fitted him exactly for his new duties.

Dr. Young stepped into this position

SANITARY COMMISSIONER OF CHICAGO.

out of the Federal service, in which he had been employed for twenty-two years, in the marine department. He had recently had surgical charge of the Public Health and Hospital Service, at Chicago. He is a graduate of the University of Maryland. He was in control of the quarantine in three yellow fever epidemics. He spent one year abroad, with headquarters at Naples, protecting the emigrant vessels from southern Italy and from Sicily against cholera and other diseases. Later he was in charge, for a considerable time, of the quarantine, on the Atlantic coast, against contagious diseases.

Dr. Young's work in Chicago is of the constructive order. His idea is to push out in several vitally important directions. One is the more thorough medical inspection of school children and subsequent care of their health.

LOS ANGELES MUNICIPAL NEWS
A Newspaper Owned by the People — City Business Is Your Business
VOL. 1, NO. 4. LOS ANGELES, CAL., WEDNESDAY EVENING, MAY 6, 1912. ONE CENT A COPY

LAST December the people of the City of Los Angeles voted in favor of establishing a newspaper, to be owned and operated by the city, and on April 17th the first number of the "Municipal News" made its appearance and was distributed to the citizens, free, to the number of 60,000 copies. The $36,000 per annum appropriated by the tax-payers for the purpose of issuing the paper is accepted by the manager as representing paid up subscriptions to that amount, so no direct charge is made for the interesting twelve-page weekly which is designed to tell the citizens just what is being done with their money paid for city taxes, and just what their servants, the city officials, are doing.

The editor presents his paper as a weekly report to the stockholders of that corporation known as the City of Los Angeles, and in order that it shall not be an organ of any party or administration, the columns are thrown open to each party which has received a minimum percentage of the total vote at the previous election. Thus there are at present five parties represented in each issue, a column being supplied by each county chairman. Ordinances which are to come before the people or the council are also discussed in the "Municipal News," arguments both for and against being placed side by side.

The local merchants have responded liberally to the invitation to advertise in the new venture, and the amount received from that source will be used to improve the paper and increase the number of copies issued. A standard so high that few newspapers would maintain it, is set by the "News" in receiving advertisements; all business that is in the slightest degree questionable is barred, and the quack, the wildcat promoter, and the liquor dealer cannot buy his way into the advertising pages.

The editor and general manager of this unique publication is Robert E. Rinehart, a man of wide newspaper and magazine experience.

Mr. Rinehart was born thirty-four years ago in Louisville, Kentucky. He is a graduate of Princeton. He was on the staff of the "Newark News," the "New York Sun," and later edited the "Home Magazine," so that he has seen the publishing business from various angles. The appearance of his paper indicates that he is making good, and the comments of the tax-payers impress one with the thought that they are well satisfied with the way their newspaper appropriation is put to use.

A forward step in honestly catering to the needs of the public in the matter of news evidently has been taken by the city of Los Angeles. He seems to be an unbiased way of presenting the truth of giving all interests an equal chance.

EDITS A MUNICIPALLY OWNED NEWSPAPER.

THE YOUNGEST POSTMASTER

IF the average Boston girl were in a home where she could look for a hundred miles and not see a human habitation, nor even a tree, she would think it a rather lonesome place.

Miss Jean Manassa, of the remote little settlement of Manassa, Wyoming, Boston-born, until recently lived under these conditions, and moreover had the real distinction of being the youngest "postmaster" in the United States.

Her first essay at conducting Uncle Sam's business was in a tiny store away out on the plains, with cowpunchers, ranchmen and hunters for patrons. So efficiently did she carry on her work that the Government honored her by giving her a post office of her own and naming it after the fascinating young official.

In a letter she wrote: "From my store and post office you can't see a tree. One can look for one hundred miles into the mountains and see them covered with snow. I often think of the many crowded cities and then look out at the acres and acres one can have for just living on it."

Under such conditions a girl must have courage, pluck, and initiative. The late postmaster of Manassa possesses all these in a marked degree. She rapidly adapted herself to her Western environment and became almost as much at home in the saddle as is any cowboy of the plains. She found, in the wild sweep of the winds across the cacti-dotted plains, in the cry of the coyote, in the bark of the prairie dog, a companionship that permits of no loneliness, even in the vast open stretches of Wyoming. The very breath of life that one seems to take in with every gulp of air, the exhilarating gallops, the feeling that one is free, independent of the turmoil, of the keen competition of existence in the city, the plains gave her.

UNTIL RECENTLY, THE YOUNGEST "POSTMASTER" IN THE UNITED STATES.

One can pass over the counter a bolt of goods or a pound of sugar several times a day, sort the mail, distributing the various pieces according to names in the two or three dozen pigeon holes allotted for the purpose, without the work's ever proving either fatiguing or monotonous.

Miss Manassa abandoned her store and postmastership recently for another vocation — that of marriage.

A FINISHED SUBGRADE SECTION OF DU PONT'S GREAT ROAD GIFT TO THE STATE OF DELAWARE.

STATE ROAD FROM A PRIVATE PURSE

By

BAILEY MILLARD

THIS story has to do with the most important event in the history of the Du Pont family, whose name has been known for generations to every man in this country that ever carried a rifle and to every boy that ever loaded up an old musket to go out and shoot ducks. For over one hundred years the members of that family have been making gunpowder on the banks of the historic Brandywine, in the State of Delaware, and, incidentally, they have been making money—heaps of it. For whenever this country has gone to war, it has first gone to the Du Ponts and contracted with them for the fulminating force to project its bullets and cannon balls into the camp of the enemy. These contracts have made the Du Ponts' coffers heavy with ducats. Nobody knows how rich they are, but their wealth is enormous.

The good folk down in Wilmington, Delaware, will tell you that the Du Ponts have made the town and the State. They employ more people than any other powder manufacturers in the world, and Wilmington, being the center of their activities, has reaped goodly benefits from them in an industrial way. The Du Pont skyscraper is the pride of the town and Du Pont money is building a big hotel in the place which, though it has nearly 100,000 inhabitants, has been making shift in its slow way with an old war-time caravansary with a mansard roof and papered bathrooms.

To repeat, the Du Ponts have done a

great deal for Delaware in the industrial line, but they have done nothing very conspicuous for the State in any other way, though their private charities have been considerable.

When, two years ago, he arrived at the age of forty-seven, Thomas Coleman Du Pont, the president of the great powder company, a man of many millions with a good reputation and a bad digestion, perhaps fearing that he might not live many years longer and doubtless because he really is a good fellow and a philanthropist at heart, determined to do something big for the people of his State and for the glory of the Du Pont name while he was yet alive. At first he thought of building an elaborate memorial fountain in Wilmington. But that was not a large enough benefaction to satisfy his philanthropic spirit. Then he thought of a hospital and after that of a manual training school. Having been in the Boston Institute of Technology and come out a very good engineer, the training school idea was the one which he most favored. He was still revolving this latter project in his mind when one day while out in his automobile bumping over a rutty road in central Delaware, his eye took in the dismal stretch of highway ahead and an inspiration seized him.

THOMAS COLEMAN DU PONT.

"I am building the best road that I think is possible for the country through which it is to run. I intend to insure its maintenance for ten to twenty years, if necessary; after that I shall expect the State to look out for it."

"What this State wants is good roads," he declared, "and I'll put my money into them instead of into those other things which after all would be of no benefit to the people outside of Wilmington. I'll build the straightest, the widest and the best road in the country and it shall reach from one end of the State of Delaware to the other."

And verily it was a big idea in the benefaction line and an original one, for no multimillionaire, anxious to leave a monument to himself, had ever written his name indelibly across the map of his State.

Coleman du Pont is a man who acts quickly. Having conceived the idea of the state-long boulevard, he immediately began to interest influential people in the project. The assembly was in session and he went to leading legislators and asked them if they would put through a bill that would enable him to make the gift of the great highway to the public. The members liked the idea and consented to act. And so the Coleman du Pont Road, Incorporated, came into being in accordance with an act authorizing any boulevard company which would comply with certain conditions, to construct a highway from the southern to the northern boundary of the State. Chief among these conditions was that such a company should give to the people of Delaware, free and clear of any encumbrance, a road for vehicular travel from one end of the State to the other on as nearly a straight line as was practicable.

Immediately the eyes of the leading public men of Pennsylvania, Maryland and Virginia became focused upon this great and unique project.

"If this fine boulevard is to run through Delaware," thought the Pennsylvanians, "why not extend it right through from Wilmington to Philadelphia and then on to the New Jersey border?" This idea spread through Quaker-land and so popular is it today that there is no doubt that before the completion of the Du Pont boulevard the steam rollers will be trundling on a broad, smooth right-of-way through Penn's Woods and down to the Delaware line. And if the Southern people take it up, as they say they will, there will be a new and more peaceful cry of "On to Richmond!"

We of ampler States are always likely

to look upon Delaware as a little vest-pocket affair, only a half-size larger than Rhode Island. And so it is — comparatively. A visiting Texan once bragged that he had walked across the State of Delaware before breakfast, which might easily have been done, as there are places where it is not more than twelve miles broad. The State has but three little counties and a population of only 202,000, the smallest save that of Nevada and Wyoming. But it has length if not breadth, so that there is a chance for a fairly straight road over one hundred miles long within its boundaries. This road Coleman du Pont is going to build. In fact, he is already building it, and, judging by the solidity of that portion already graded it is going to last a good many years, with no very great annual expenditure for necessary repairs.

"Boating" by Motor Car.
A slow and monotonous "pastime" in Delaware at certain seasons of the year.

A Delaware Road in Winter.

As soon as the boulevard act had been passed by the Assembly and approved by the Governor, Mr. Du Pont began the preliminary surveys for the road, taking the field himself and acting for a time as his own chief engineer. Now Du Pont is a man of ideas. Not only is he the first man to get into his head the project of building and giving away a hundred miles of solidly constructed highway, but he is also the first man to join the lines of a survey by skyrocket and parachute signals and the first man to use for survey work a particular kind of motor campwagon, so devised as to spread its white wings out over a dozen persons.

Some wise people laughed at the idea of the pyrotechnics and parachutes.

"I didn't know this was a-goin' to be a skyrocket road," said one peach-grower to another as he saw a red glare streaking the evening sky. "I sh'd think the time to set off the fireworks would be after the job was done."

Now the why and wherefore of the skyrockets was this: Southern Delaware, where the survey work was begun, is a flat country and affords no opportunity to employ the usual methods of location by observation from elevations. Such being the case and as there were no adequate maps of that part of the State, it was necessary to evolve some scheme to connect desirable points without running numerous random lines. The engineers puzzled over this problem for some time.

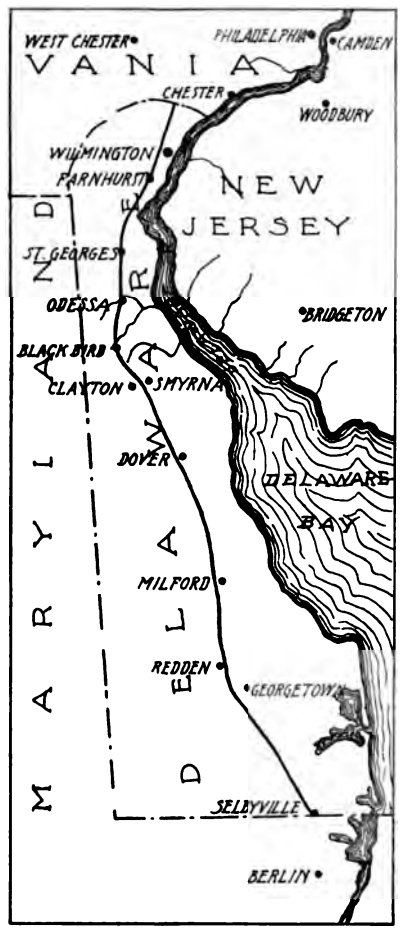
"We're practically working in the dark," remarked an engineer to Mr. Du Pont.

"Well, if that's the case," was the quick reply of the great road-builder, "why not light up a bit? How about skyrockets?"

"Just the thing," said the engineer. But it was found on trial that the rockets did not remain long enough in the air to afford sufficient opportunity for observation. So Mr. Du Pont had heavier rockets brought in and to these he had parachutes attached, each parachute carrying a light of changing colors and staying up long enough to afford a "sight" from one distant point to another. Some of the bigger rockets used weighed as much as eight pounds apiece. One night a survey party sent up a rocket that was plainly seen by another party fourteen miles. The line that was run from the "sight" thus taken struck the desired point within a few feet.

As for the motor campwagon, it was a very convenient and comfortable affair. It had large receptacles for instruments and tools and the "wings," as the tent portion of the device was called, were so arranged that they could be spread at a moment's notice whenever the party was overtaken by a storm or wished to camp for the night. I have seen a great many surveying parties in the field, but I have never seen any that had as practicable an outfit as this or that was so well provided with means of rapid transportation over rough country. The motorwagon was built for any sort of road or no road at all, and, with the tenting combination, it illustrated Mr. Du Pont's clever way of going at a big enterprise. But what illustrated this in a larger way was the kind of men he gathered about him at the beginning of the work. No engineer was too good or too high-salaried for the Du Pont boulevard. The job if worth doing was worth doing well.

"Who are the best men I can get in the whole world to help me lay out this



WHEN COMPLETED THE ROAD WILL BE ONE HUNDRED SIX MILES LONG.
The estimate of the cost of construction is said to be from $2,000,000 to $3,000,000.

ONE OF THE FEW WELL-BUILT HIGHWAY BRIDGES IN DELAWARE AT THE PRESENT TIME.

road?" he asked of a well-known engineer.

"Ernest Storms of Brussels, Belgium, and Thomas Aitken of Cupar Fife, Scotland," was the prompt reply.

"All right; I shall engage them as consulting engineers. But I want an American for Chief Engineer. Who's the best man?"

"Frank M. Williams of New York," said his adviser. "He's a big man in that line and has a world-wide reputation."

So after the first general observations the three men were engaged at large salaries and they immediately took the field. Storms is the celebrated Frenchman who supervised the construction of the magnificent roads built in Belgium for the late King Leopold. He is the author of several big books on the subject of road-making—marrowy books that are taken from the library shelves every day by engineers who want to know the best way of getting around a hard problem. Mr. Aitken is a county surveyor in the best-roaded region of Scotland, and is also a much-quoted authority. Mr. Williams is a man of wide experience in the construction of modern highways. His roads are well-built and they wear. For his chief assistant Mr. Williams chose H. E. Breed, a man well up in this line of work. He is also aided by F. A. Rossell, an engineer of up-to-date ideas.

When the European engineers came over and gazed at the low-lying, muddy, rutty, twisting streaks of bare earth charitably designated as roads in Delaware, they looked at each other and smiled. And Williams, the American engineer, smiled with them. For of all the main-traveled highways in all the country those of Delaware probably are the worst. There had been a heavy rain and as Mr. Du Pont's automobile, bearing the three engineers and the millionaire road-maker went bumping and slushing along the flat, muddy, unshaded, desolate trail, and plunged into a long, shallow pond of surface water, the Scotchman looked at the Frenchman and exclaimed:

"And they call this a road! Weel, America's a great country, but they've got something to learn about road-making—that they have."

It was the drainage problem that puzzled the engineers at first. Flat as a pancake and only a few feet above sea level, the whole of Sussex County did not seem to afford any chance whatever for drainage. It was decided that the road would have to be so elevated as to make its own watershed. To raise what was going to be eventually a two-hundred-foot boulevard of that great length even a few feet above the surface was going to cost something, but Mr. Du Pont had expressed his willingness to see the

road through in good shape even if it took four million dollars to do it, and with money men can raise roads as well as mortgages.

The Sussex County headquarters were established at sleepy little Georgetown. A commodious house was hired and fitted with modern hotel and club accommodations, for Mr. Du Pont believes in making his men comfortable. After the preliminary surveys were run and a line was established through the county from Selbyville on the southern State border, through Millsboro, Georgetown, Lincoln and Milford, near the Kent County line, and roughly sketched from there northward through Dover, Smyrna and Wilmington to the Pennsylvania border, contracts were let for the building of a series of experimental roads, and these were constructed in the neighborhood of Georgetown, Selbyville and Milford. It was attempted to run traction engines and motor trucks southward through Sussex County for use in the building of these experimental sections, but so thick and heavy was the sand along the county roads that it was impossible for these self-propelled vehicles to make any progress. So they were shipped down by the Pennsylvania Railway and then driven along by makeshift means to the places where they were to be used.

Before actual construction was begun, Storms and Aitken made exhaustive studies of subsoil conditions, sinking a great number of test pits along the final survey. It was under their advice that the experimental sections of road were built. These sections were from fifty to five hundred feet in length, and different compositions, including concrete, oils, tars and asphalts and such bitulithic materials, soils and macadam as were to be found in the country, were utilized. This preliminary road-making was executed with thoroughness.

This work was done last summer and autumn, and was continued through the winter as the weather permitted. In the spring the work of main road construction was attacked in earnest under the superintendence of Mr. Williams. Mr. Du Pont was in the field much of the time. Never have I seen a better example of the influence of a big pet hobby upon the health of a man than that of this great enterprise upon Mr. Du Pont. From what I had heard of his bad health I expected, when I went to see him, to find an invalid. What I found was a pile of dynamite. Beside carrying on

A Cleared Right-of-Way through Young Timber.

Big Trees That Stand in the Way Are Gouged out of the Ground.

ONE OF THE RUMBLING TRAINS OF STONE CARTS HAULED BY A TRACTION ENGINE.

LAYING A SECTION OF CONCRETE FOUNDATION.

the business of the new road and the old powder company he has on hand an array of other enterprises that would bewilder an ordinary man.

"Yes, it has been a good thing for me physically," he said to me. "Camping out is right in my line. I am able to be in the saddle or the auto twelve hours a day, and I take a lot of pleasure in the outdoor life. The work is going on well. I am trying to build the road where it will do the most good, and at the same time I am not going to devastate Nature any more than necessary. See that tree there. It's a beautiful one and it shades the road, but though it's almost in the middle of the right-of-way I'm going to let it stand and run the road to one side of it.

"The only thing that bothers me in this whole business is the attitude of the farmers. You would think that they would all be glad to see the road built, considering the tremendous advantage it's going to be to them, but many of them will not give rights-of-way through their property, and where I offer to buy, they put preposterous figures on their holdings. One man had been offering his farm for $3500, but as soon as he heard the road was coming he ran the price up to $7000, on the ground that the boulevard was going to improve his place to that extent. Human nature!"

Human nature! And the man referred to is only one of hundreds who are blocking the road by their hostile attitude. There are others who profess to believe that the Du Pont boulevard is intended as a scheme to further enrich its projector who will turn his two-hundred-foot right-of-way over to the Wabash Railway in which he is said to be interested. Some say he wants it for a trolley line, and shake their heads when asked to grant a strip of land through their farms. I heard one old hayseed declare that he would be darned if he was going to let them biles run over his

chickens, not if he could help it.

Human nature! Yes, and human nature plus politics. It is hardly surprising to find in the State which gave the world a John Edward Addicks that every man you meet is a politician. Young men in Delaware are said to talk politics to their sweethearts while they are "sitting up" with them, and even to their grandmothers. There are daily upheavals, and as soon as a master mind thinks he has got things fixed up right, presto! Delaware is all against him. And so the politicians, and particularly the peach- and apple-growing politicians, are now fighting Du Pont and his road. Much hostility is expressed by farmers against the assembly for granting him the franchise, and yet next month, so fickle is popular opinion, the tide may turn in his favor. Just now it is decidedly unfavorable, and the work ceases from time to time under stress of litigation.

But surely here is madness. From a utilitarian point of view the road is going to be a big thing for Delaware, and the people, though all politicians, can hardly fail to see it. As showing human nature again and perverse human nature at that, it is a fact that the people of nearly all the larger centers not touched by the first survey are protesting against Du Pont's action in leaving them out. The good folk of Odessa and around there are so afraid that the road will not pass through their territory that some of the biggest landowners are laying out every inducement to be included in the route. Daniel W. Dan-

THE SMOOTH CONCRETE BED READY FOR THE ROLLER.

WORK LIKE THIS IS GIVING DELAWARE ONE OF THE COUNTRY'S FINEST HIGHWAYS.

ANOTHER SECTION OF THE ROAD SHOWING MORE OF THE CONCRETE FOUNDATION.

der P. Corbit, both with offer to donate a 200- ıy strip through their ter- : means the giving away d. Middletown is eager d is protesting because it Townsend is in a similar ' New Castle, where it is ı to widen the old forty- d, the farmers will not rrow strips on each side) the two hundred feet of ey object strenuously to ıd are placing the matter their lawyers. In Brandy- there is also a big howl nation, and from Smyrna ɔther great protest. The that they cannot afford ınd cut up by the boule- were built through their ld be shut off from their ɛ road could be fenced up

ing hot and blowing cold to dash the spirits of s known as a good fighter that he is going to build if the whole State rises which it won't. For un- he people know that he is ıg for them and that they efit by it.

Pont offer was made out 'aveling man to me in the ton, "the people would : this isn't out West—it's that explains a lot to ' this State as I know it." : position of a man trying ıte the best road in the ving virtually to force the t it! Most men would hands in disgust and call from the field. But going to recede one inch ıal intention to give the ı boulevard. In fact, he anvil and drowning out the opposition wherever Village folk stare as they action engines and trains ıe street loaded with ma- ew road, and as they gaze Pont motorwagon, flying hey not only wonder how t is going to kill, but they nudge each other and say to each other significantly:

"Well, it looks as if that road was going through."

Going through! Nothing can stop it—that is, for long. An army of men is in the field and they have been working north and south. As I saw it in April, it was Homeric work. Following the straight line of tack-centered stakes came the axmen and the dynamiters. Great trees fell with a roar and a crash and were speedily sawed up and jerked to one side while their stumps were upheaved by explosives. Then followed the graders, with their mules straining at the scrapers. The rock crushers rattled and roared and the traction trains came steaming in, dumping their loads of rock, which were mixed with cement by the busy shovelers and grout-pourers, and over the concrete foundation and up and down and back and forth trundled the steam rollers, packing the great pavement smooth and hard to make easy the path of future motor-truckmen and the automobilists who shall go forth bent upon marketing enterprises or pleasure and chicken-killing. Straight up to the Pennsylvania border, in the north, the road will go, there to be joined by the Quaker boulevard at some future day; and straight to the south and the Maryland line—as straight as the lay of the land and the objections of the farmer, who is being benefited in spite of himself and his human nature, will permit.

So that possibly within a year, and surely within two, the great Du Pont boulevard, upon which envious eyes of other less favored States are being cast, will be an established fact.

It was inspiring to watch the workmen bringing into actual being this great good-road object lesson to Delaware and the whole country. The delvers and pavers were nearly all of that grand army from the ancient Roman Empire whose slaves built the great Appian Way. But though fallen from their high estate, the Du Pont road-builders, are not slaves. These hardy men, living on sour bread and macaroni, are doing the heavy labor for a nation that tends toward luxury as did the people of ancient Rome. In themselves these workers are an object lesson in that thrift and industry which

subdues the earth, and it is a thrilling sight to see them fell the trees and level the ground on the great highway. When the work was halted by Mr. Du Pont temporarily a few weeks ago, it was said that he would be forced to reduce his right-of-way to one hundred feet, and it may be that this will be ordered by the courts as a compromise between the farmers and Du Pont.

At the next session of the assembly the boulevard act will be amended so that Mr. Farmer whose land is cut in two will be granted the privilege of crossing the right-of-way at frequent intervals, and other points overlooked in the bill as it passed the legislature will be adjusted.

Mr. Du Pont laughs at the idea of the right-of-way being turned over to a railroad company. Under the terms of the act this would be impossible, but if the people want to have a trolley line built upon it at any future time this can be done by suitable amendment.

The good-roads people of Wilmington are mightily pleased at the prospect.

"We are awfully tired of banging over the ruts and through the sand in our machines," said Charles Guyer, Secretary of the Delaware Automobile Association, to me. "And those oyster-shell roads in the southern part of the State cut the life out of a tire in no time. It will be a great day for the autoists when the Du Pont road is opened for travel."

As for the big fruit growers, they are, as a rule, in favor of the boulevard. And why not? No long hauling is now done on the Delaware roads. Selbyville, in the south, where land is cheap and much of it is lying untilled, has a record of one hundred carloads of strawberries shipped in a single day. Its market is Wilmington, and the freights are high. When the motortrucks begin to hum up that smooth roadway to Wilmington

bigger profit in strawb
Delaware apple-grower
sively proud of those fi
national exhibitions, w
profit in apples. So als

To complete the symp
faction Mr. Du Pont
tural experts at work
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garded as untillable so
watermelons and luscio
Waste lands are going
and soon the sandy
County will blossom lil
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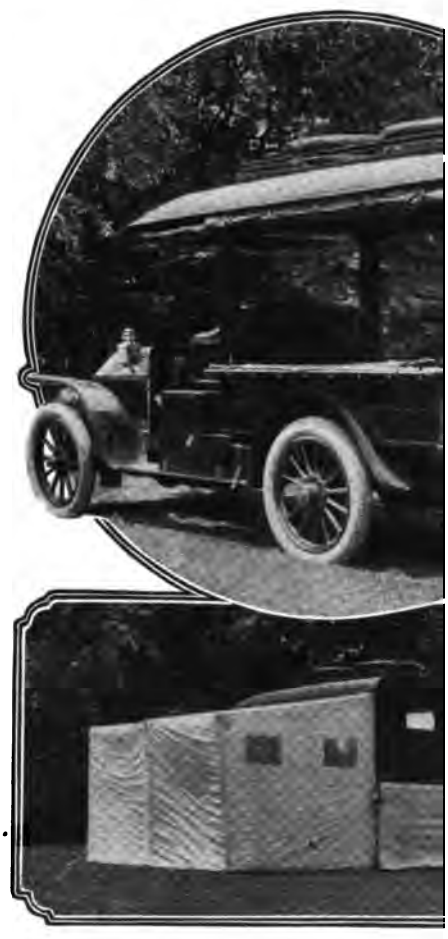

THE DU PONT MOTOR CAMPWAGON AS IT APPE
ROAD. AND WITH ITS "WINGS" OU
The engineers can be housed comfortably for the
moment's notice.

The PNEUMATIC HAMMER

)U can hear my sharp staccato as I play an obligato
On the girders of a structure that is forty stories high,
the crowd below is gawking at the iron workers walking
a slender swaying "I" beam sort of tethered to the sky;
:e the song and I'm the chorus, and we have our job before us
we tie the steel together with the rivets red and hot,
he sparks they hiss and spatter as I clatter, clatter, clatter!
I like to have it noticed that I'm Johnny on the the Spot!

I'm numbered with the toilers who are turning out the boilers
you'll find my masterpieces on the land and on the sea,
ng railroad trains in motion, driving liners on the ocean,
supplying the compressors with the force they give to ME!
task, I sure attack it with the maximum of racket,
no shy retiring worker, I am talkative and loud,
batter and I chatter as the sparks go spatter, spatter
I love the busy city and the noises and the crowd!

e they build the ships for battle you can hear my airy prattle
I hammer on the framework of the warriors of the deep,
where bridges span the river I can keep your nerves a-quiver
h my everlasting clamor which would never let you sleep.
ie young tradition shaker, I'm the blatant empire maker
the prophet of tomorrow and the builder of today,
and ancient doubt I shatter as I clatter, clatter, clatter
a song of hope and progress and a yell of "clear the way!"

—Berton Braley

MILITARY BANDS of the NATIONS

UNITED STATES ARMY
REGIMENTAL BAND.
MOUNTED.

RUSS

TURKISH
BAN

THE FAMOUS SCOTCH HIGHLANDERS WITH KILT AND BAGPIPE.

BAND OF THE ENGLISH LIFE GUARD.

ROUMANIAN REGIMENTAL BAND.

LITTLE OF THE "POMP AND CIRCUMSTANCE OF WAR" HERE—A JAPANESE DRUM CORPS.

PRUSSIAN FIFE AND DRUM CORPS.

AN EGYPTIAN INFANTRY BAND.

Dutch In

Rehearsa
Cuira

Band of a
Regiment of
Swiss
Infantry.

Bu
Re
Ba

BAND OF A BOSNIAN INFANTRY REGIMENT.

ALBY
H
UMS.

BAND OF A BLACK REGIMENT, SIERRA LEONE.

THE KIND OF BOILER THAT CAN BE TAKEN APART TO CL
An English patent compound superheated steam semi-stationary condensing

MAKING STEAM WORK H

By

CHARLES FREDERICK CART

GIVEN a chance to save a million dollars in one lump any American would acquit himself creditably, if not brilliantly. But no free-born American citizen would so demean himself as to save a paltry hundred dollars. As for saving a nickel the man who would even hint at such a thing would disgrace himself and his family to the third generation. But in countries where the unit of the monetary system is the franc or the lire, which are but the fifth part of a dollar, or the mark or the shilling, which are a shade less than a fourth of a dollar, things are different. In Europe it is so long between francs that before a man gets one he has plenty of t that it only takes a hu make a franc; and th enough francs he will h these few sentences is sence of all the reaso lows on the other sid can beat us so badly motors that we do not cluded "Among those competition.

It was in Germany t tical gas engine was e German, too, who inv oped the Diesel oil eng to have landed on the s

merely for use on land,
lsion of ships. Also, it
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ıd, then the oil engine
two the best of the gas
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time the honors appear
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that only an expert ac-
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er is the essential fea-
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ıs "Steam having a tem-
han that due to its pres-
'heating steam expands
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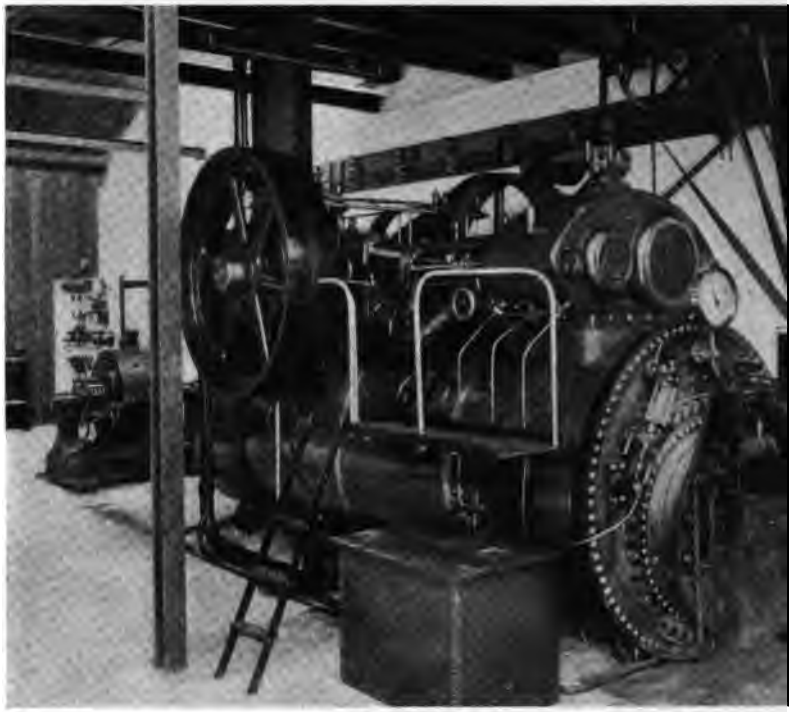
volume is constant su-

perheating will increase the pressure. In ordinary practice superheating increases the volume so slightly that the rise in pressure is not appreciable. Steam at 200 pounds pressure when superheated 100 degrees will have a temperature of 487 degrees and still remain at 200 pounds pressure. Superheated steam partakes of the nature of a perfect gas. Like a gas it is a poor conductor of heat. At 170 pounds pressure with 200 degrees of superheat it takes 3.27 cubic feet of steam to weigh one pound, while only 2.47 pounds of saturated steam at the same pressure will weigh one pound.

The object in superheating is chiefly to eliminate wasteful condensation and consequent loss of heat in the cylinders. This can only be done by admitting the steam at such a temperature that it can give up enough heat to raise the temperature of the cylinder walls and still not lower its own temperature below the point of evaporation. Opinion differs regarding the most economical degree of superheat, though it is well understood that a small amount is not worth while. In practice the amount of superheat varies from 100 to 200 degrees. The highest superheat yet attempted is 250 degrees, which means an actual temperature of nearly 650 degrees. If the temperature was carried any higher it would result in the rapid reduction of the strength of the steel.

The apparatus by which this wonderful improvement in the quality of steam is effected is nothing more than a series of small pipes in the smokebox. The arrangement of the coils of pipe varies, and so does the style of the header in which all the coils terminate. But all alike are so arranged as to expose the whole surface of pipes and header to the hot gases from the furnace. In an internally fired boiler the heating surface of the superheater is usually about thirty times the grate area; and in a watertube boiler about ten times the grate area. To make a different comparison, the superheater's heating surface ranges all the way from half that of the boiler to as large an area as the boiler has. After being generated in the boiler the steam is conducted to the superheater where it lies in wait for the wasted heat rushing through the flues and captures it before it can seize an



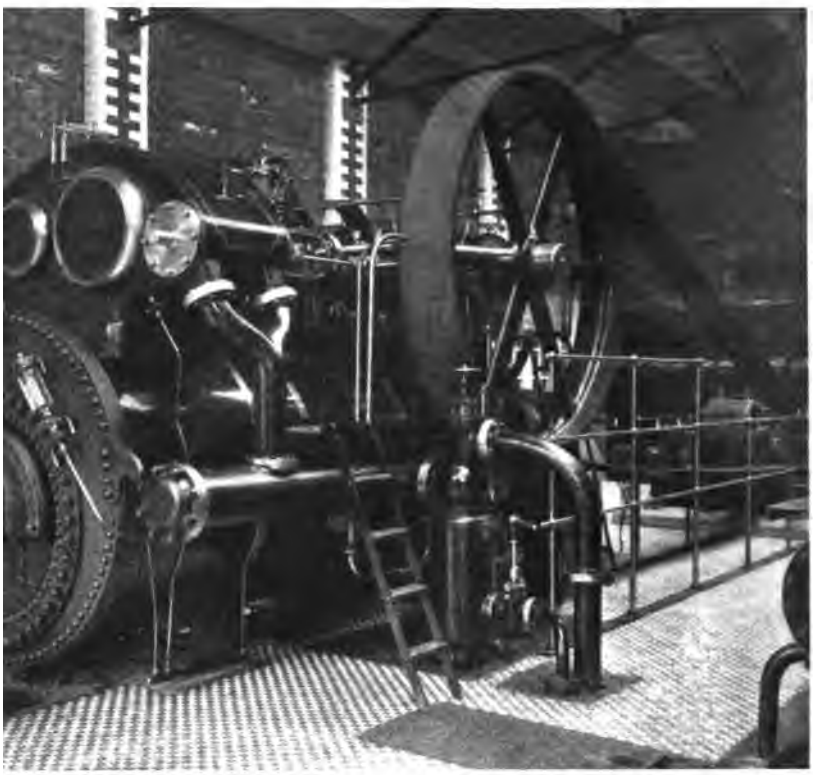
THE LAST WORD IN THE ECONOMICAL PRODUCTION OF PO
The new engine harnessed for action.

opportunity to escape up the smoke stack.

Superheated steam can travel twice as fast as saturated steam. It is possible to transmit superheated steam a distance of six to ten thousand feet without a loss of more than ten per cent in pressure; and by the use of separators to get rid of what condensation there may be, to deliver the steam in every way satisfactory for use. But no such formidable journey is ahead of the steam in a lokomobile; and this brings up the second important feature which makes the new type of engine so superior to the American home-made kind.

The great problem before the steam engineer is to prevent waste of the heat after it has been put into the steam. As one means of preventing this loss the engine is mounted on the boiler of the lokomobile. This eliminates the necessity of providing outside steampipes with their enormous possibilities for waste of heat by radiation. American engines of small size are commonly mounted on the boiler, to be sure; but the European builders have left us f simple expedient of ca and the steam dome all the former inside the walls of the cylinder rounded by steam at b Only the heads are ou are as readily accessibl other type of engine.

It is well known tha gine under proper co economical than a simp lokomobile usually has gine. After expanding high pressure cylinder ture is reduced to abo is returned to a seco superheater where it raised to about 360 deg admitted to the low From the low pressure is exhausted into a co gets down into water factories using lokomob size the exhaust steam ing the building befo condenser. From the



HOW IS THIS FOR AN ENGINE ROOM FLOOR?

a feed water heater, also
ace gases, where its tem-
ed to about 170 degrees
rned to the boiler.
es not comprise all the
omy. The boiler is care-
or covered with a thick
os or other non-conduct-
that the loss of heat by
the boiler is reduced to a
unt. And there's more
of the usual locomotive
mmon among small-sized
n power plants, with the
grate directly exposed to
that all the heat possible
that way, the lokomobile
furnace; that is, the fire-
surrounded by water, ex-
. At every possible point
eat is carefully guarded

lt of all these precautions
much smaller boiler is re-
luce a given amount of
power than would be needed to yield the same amount using saturated steam. Of course the superheater costs money, so the saving in first cost of the plant may not be very great. The saving is in operation. In an ordinary small American steam power plant, say from twenty-five to two hundred horse power, anywhere from three to five pounds of coal are required to yield one horse power for one hour. But the lokomobile only requires from 1.2 to 1.4 pounds of coal per horse power hour. It has managed to skimp along on one pound, and on one occasion, during a test run, achieved the remarkable record of .71 of a pound of coal per horse power hour. That put it far ahead of the gas producer engine which needs, on an average, one pound of coal per horse power hour. Now coal costs money, as any one who has to buy it can testify; hence, every dollar saved on the coal bill without reducing the power output is one hundred cents gained.

Another advantage of the lokomobile is that being compressed into the smallest possible space, and also because a much smaller boiler and engine are required to produce a given amount of power with superheated than with saturated steam, less money is required to provide an engine room. Again, being small for the amount of power produced one man can run a good sized plant—say up to a capacity of 250 horse power—alone. This, however, is by no means the limit of size, for lokomobile type plants are built up to a thousand horse power. The one man who runs a lokomobile being necessarily the engineer, is likely to be more competent than the average fireman, so there is still another chance to save on the coal pile. While only one man is needed to run a gas or oil engine of pretty large size, it takes an expert mechanic to adjust and repair such engines, which not infrequently require a deal of tinkering. A lesser degree of talent suffices to keep a steam engine going.

Furthermore, an internal combustion engine of any kind has a very definite limit on its capacity. A hundred horse power internal combustion engine will deliver a hundred horse power, if it feels like it, but it will do no more, no matter what inducements are held out. A steam engine, however, like a music hall artist, is always ready to oblige. If the boss happens to need a hundred and fifty horse power for an hour or two in an emergency the hundred horse power steam engine will help him out. For all these reasons a number of gas and oil engines have recently been replaced in England by superheat steam engines.

Another notable advantage which the lokomobile has over the ordinary American type steam plant of small size is the ease with which the boiler can be cleaned. The fire box and tubes are built together to form one piece and bolted to the boiler so that by unscrewing a lot of nuts the whole interior arrangements can be drawn out of the boiler shell, so that everything can be thoroughly cleaned, and then replaced. The operation of taking the boiler apart and putting it together again consumes five or six hours. Compare this with the clumsy and utterly inefficient washing which is the only way the small American bo
The American small b
cleaned, but gradual
thickening coat of sc
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lokomobile with 200
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The importance of
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33 per cent.

It is only the small
the man who most n
who does not obtain
modern engineering c

ING THE DIVER'S REACH

By

HENRY GARDINER

enty-five, fifty or sev- feet deeper in the ocean depths than an now go lies treas- easure of gold and dge—that has set the for ages. Within the if it were but on the e the deep-sea worker e, sunken argosies and of life lie side by side,

existed in the ocean undred and ninety feet things lying deeper hopelessly out of the ig human being than the past. One hun- t has been the outside t plunging our bodies use old ocean would ut of us if we went an body will endure h pressure, and pres- specialty in those mys-

n have recently come e, how- tions of id have They are s, too— and Mr. London school, ane and Rees, of They say and shall a fact— the dis- into the . They have the we have we will

DIVER TAKING A SAMPLE OF AIR FROM HIS HELMET FOR SUBSEQUENT ANALYSIS.

but undertake to go after them right—or rather, if we will undertake to return with sufficient care, after the trip. And they support their statements by records of long experiments and by actual experiences of their own.

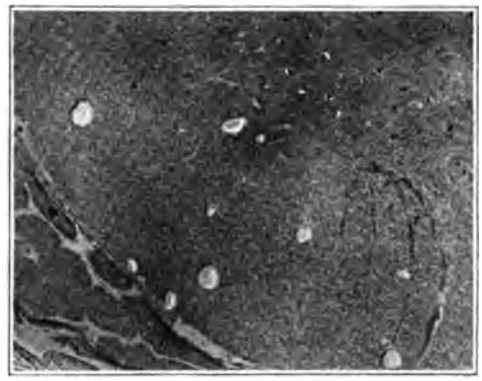
Nearly everybody who has read the magazines and newspapers in recent years has heard of a strange disease, called the "bends," to which men are subject who work under great air pressures—the fellows, particularly, who go down into the caissons for deep tunnel-work, where compressed air has to be used to keep water or mud from coming in upon them to drown them. "Sand-hogs" and divers alike have been the victims of the malady, which no one has very clearly understood. Physicians and other scientists have long studied it and treated it with varying success. Men afflicted with it show symptoms of asphyxiation, paralysis and other equally serious things, sometimes resulting in death, often in permanent injury.

Now the investigating Englishmen have found out what causes the "bends." And in that discovery lies the secret of the new diving-power they promise us. It is a pretty common habit of human beings to breathe air into the lungs, and one that the race has never been able, as yet, to shake off. The air we breathe is under pressure, normally, at sea level, of about fifteen pounds to the square inch. At a depth of one hundred feet under water, there is a pressure of forty-four pounds to be added to this, when the diver tries to reach the low levels. That makes a pressure of fifty-

nine pounds, to the square inch of body surface, that he must resist. At a depth of four hundred feet under water, the pressure reaches the enormous figure of one hundred and ninety-one pounds per inch—which would be high pressure for a locomotive's boiler to contain in regular work. Hence, when men have essayed to drop down to these depths, they have found conditions that they were not prepared to meet.

Curiously enough, however, like the Irishman who complained that it was not the falling that hurt him but "the stopping so quick," so it has not been the diving into high pressures that has cost divers their lives or their health, but the coming up too rapidly. This has been understood in a general way, for some time. In the caissons, where the sand-hog works, there are air-locks, through which, by easy stages, a man ascends from the depths and through slowly lessening pressures, till he reaches the surface. The deep-sea divers have observed something of the same formula in rising to the surface of the ocean, coming up by slow and careful degrees. But, even with the greatest care and the most intelligent assistance, the men who have risked themselves in this class of work have suffered terribly and mysteriously from the disease which seemed to be a very ally of the sea to prevent our uncovering its secrets.

Now, the "bends" is a strange malady, that has baffled everybody till the four Englishmen determined to solve the problem it offered. It is caused by the very air in the body of the man who contracts it. When we breathe, we take into our lungs a combination of oxygen and nitrogen, of which the blood takes the former, for cleansing and fuel purposes. About eighty per cent of the air, roughly, however, is nitrogen. And it is the nitrogen that causes the "bends." Under sixteen pounds pressure, with according to our el level, it behaves very pressure, as in the water, it acts quite di of passing peaceably as it normally should, game of hide and seek



MICRO-PHOTOGRAPH OF A SECTION OF THE SPINAL COLUMN OF A GOAT THAT WAS KILLED BY SUDDEN DECOMPRESSION.
The large bubbles are nitrogen.

A man's body is a c The tissues are soft a ceiving the nitrogen u only capable of receiv of resisting. When t point under water w becomes high enough gen off into the capil he becomes a fit subje and the only way to sa him back to the surfa the nitrogen, which m tiny blood-passages, ca out of them again, bef sure is entirely remove too quickly, the nitrog tissues and he becom paralyzed, or somethin him that is both painf ing, if not actually kil

Professor Haldane experimented with th submerging them and to the surface with eve riety of method and sp pigs and dogs and goa showed all varieties o men had been suffering the "bends" as truly as

quickly out of the air-
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SUBMITTING TO AIR-PRESSURE IN A SPECIALLY PREPARED TANK.

medium pressures to
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found out these things,
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/ showed that a goat
ures that no man had
lived, up to that time.
o have approached a
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later, paid dearly for
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, however, Mr. Green-
) air-pressure, in a spe-
nk, in a degree equal
h of two hundred and
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e than any diver had
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at tank, a new leaf in
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ch they were the sub-
experiences duplicated
then to put the results
cation in diver's dress
ocean. And so a point

of the Scottish coast was chosen for the place of trial, and there these courageous men went down to depths of thirty-five fathoms—two hundred and ten feet—and actually stayed there and worked as no diver has ever attempted to do at much lesser depths. More than that they descended and ascended at greater speeds, observing only their newly discovered principle of making the last stage of the ascent slowly; and they felt no ill effects of any account whatever.

They established the fact that divers can go down to the depth of thirty-five fathoms in the astoundingly **quick** time of two minutes, while, previously, the interval prescribed for anything like similar depths has been close to forty minutes! They found that it is perfectly safe to ascend rapidly from thirty-five fathoms to twelve fathoms, thus getting out of the danger-zone of high pressure quickly, and thence to come to the surface more gradually, without resultant suffering. During the mounting of the last twelve fathoms of distance, the body frees itself of all excess nitrogen.

This is contrary to all accepted methods held as absolute heretofore. But the English scientists have established their discoveries as facts by long continued and often repeated demonstrations. More, they have shown by experiments with animals, that the four-hundred-foot depth can be reached with equal safety. And, now, with their power of endurance practically doubled, the divers of the world can delve after the secrets and the treasures of the ocean's bottom in a way that was only dreamed of before, and can bring up lost and undiscovered things that have tantalized us since ships began to sink and strange forms of unknown life began to wash up upon our shores with every visit of the frequent storm-tides.

THIRTY THOUSAND DOLLARS
FROM TWELVE ACRES

By

STANLEY L. McMICHAEL

THIRTY thousand dollars extracted from twelve acres of ground every year, of which at least twelve thousand dollars the farmer puts in the bank as profits after paying all expenses!

This is the record of a farmer near Cleveland, Ohio, who was formerly a city man, but who went back to the soil and made good. His name is Martin L. Ruetenik.

From the city with its blare of noises and its dusty streets this man sought out a little farm, settled down and is now making as much money as the head of many a successful business corporation. After a weary struggle of several years the ground gave forth its bounty and today he is clearing over a thousand dollars a month, owns and operates two automobiles and several carriages—has a cozy home and a happy family.

In one year—1907—the farm returned twenty thousand dolla gross receipts being a sum. For this year realize a total of about dollars in profits, after paid.

Thus this enterprisin ing one thousand dollar from his land. It is become a specialist, y that every cent is ma itself. Nothing is mar with the assistance of s

Ruetenik's little farm acres in all, but only under cultivation. Eigh ployed on these twel square inch of which is revenue in the way of

Martin Ruetenik is a of a man who has le brains. Beginning on without any special adv

THE THIRTY-THOUSAND-DOLLAR-A-YEAR FARM NEAR CLEVELA

ty and without any ex-
ıer this man, by dint of
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rm into a veritable gold
it does twice the value
ear, after all expenses

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ıt

who attempt to sow and reap their crops from advice bound between cloth covers, this farmer makes them sit up, for Ruetenik is a "book-made" farmer. In addition, he has been a very close student of government and experiment station reports. He has also cultivated a penchant for experimenting. Although cautious to a degree, he is con-

RUETENIK, THE MAN WHO KNOWS HOW TO MAKE FARMING PAY.
ı the background he irrigates his twelve acres. Eighteen men are employed to cultivate the miniature farm.

A QUARTER OF A MILLION LETTUCE PLANTS UNDER G
In the foreground workmen are transplanting the tiny growths for the October and N

stantly at work seeking to improve the quality of his vegetables and to discover new means for getting them to the people when the prices are highest.

Back in 1883, H. J. Ruetenik, President of Calvin College, Cleveland, grew inexpressibly weary of city life. He decided to go back to the soil and rest his brain and exercise his body. He had a sixteen-year-old son, Martin L. Ruetenik, whom he decided to take with him.

The Rueteniks started in to do some scientific gardening. They read up the newest methods of fertilizing their land, discussed the best ways of planting, cultivating and harvesting their crops.

When the college professor and his son balanced their books at the beginning of the first year, they discovered that they had lost about five hundred dollars. The same thing happened The third year the bal smaller. So it was th fifth year they broke e the profits began to a

The younger Ruete the use of hothouses crops. Doing a gener ness from the very fi discovered that more made from certain cr was what he was afte gan to specialize in t tomatoes, asparagus, beets and several othe main crops, however, toes and lettuce.

It was about 1888 th built his first greenho fifty feet in size and

ed growing lettuce and
early spring and later
ien it could not be ob-
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se didn't pay its way the
second year either. A
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He had 120,000 square
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The garnish on the
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cents or as high as $2.00,
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another of Ruetenik's
He sows his seed in
about February first.
is swirling above the
ider plants shoot up, the
ig kept from sixty to
is required. The little plants are carefully tended and trained in one tall vine, being hung with twine to a series of wires above. Some vines grow six and eight feet high, with tomatoes hanging ripe and red every three or four inches. A year ago Ruetenik sold 12,000 baskets of ten pounds each from fourteen greenhouses at $1 a basket, or a total of $12,000. The crop which is sowed early in February is marketed from June fifteenth to August fifteenth —long before home-grown tomatoes are available in the Cleveland territory and when they sell at from eight to twenty cents a pound.

Cucumbers are another profitable crop raised by this gardener. He begins his crop in the early spring and harvests it late in May and early in June. His crop the past year consisted of 500 bushels which he sold at $2.00 a bushel, realizing $1,000.

Four of the nine acres outdoors are set to celery, some 200,000 plants being grown. These plants are put out in June and July and are harvested in September, October and November, when they sell for about $2.00 per 100 plants. Such a crop is worth to Ruetenik about $4,400.

Pie plant is raised on sections of the twelve acres which are on a hillside and which cannot well be cultivated for other purposes. Over $200.00 a year per acre is realized on the pie plant. Each plant of rhubarb lasts about five years and is then replaced. Each year about fifty tons of manure, costing $1.00 a ton, are scattered over the area devoted to pie plant.

Several acres are devoted to asparagus, beets, carrots and other vegetables, which are set out just as early as possible so they can be marketed a few weeks ahead of the regular crop. A patch of about an acre of sweet corn was grown this year and sold at 25 cents a dozen ears. Three weeks later a neighbor living almost next door sold his sweet corn on the Cleveland market for two cents a dozen! Such is the difference in men. Ruetenik uses his brains and the other fellows don't.

A SUBSTITUTE FOR THE

By

DR. ALFRED GRADENWITZ

THE discovery of the X-ray and its use for examining the interior of the body doubtless ranks foremost among recent achievements of the human mind, and the present advance of medical science is in great part due to the valuable aid yielded by these wonderful rays to which most of our tissues are transparent. Now, as there are limitations to everything, even the X-ray has not proved to be perfect. While, in fact, in many cases inspection from all sides would be desirable, the X-ray only allows the body to be inspected in a given direction.

A German scientist, Professor W. Spalteholz of Leipzig University, has designed a process allowing transparent anatomical preparations to be obtained. This result he reached by surprisingly simple means —a purely physical process, that leaves the bulk of tissues entirely intact. As shown by comprehensive experiments, a certain optical law, which has long been known in the case of mineral substances, also applies to organized — animal or vegetable—bodies. According to this law, a given body will reflect a minimum of light and mum of transparency, and soaked in a substa refra equal fractior is true tissues vegetab sess ra dices each or body, h fraction optical based now is, ically i which compos alter th

NORWEGIAN LOBSTER MADE TRANSPARENT BY MEANS OF CHEMICALS.

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HUMAN SHOULDER-BLADE RENDERED TRANSPARENT WITHOUT THE AID OF THE X-RAY.

The same process obviously lends itself for making vegetable tissues, such as wood, etc., transparent.

The discovery of the X, or Röntgen, rays, several years ago, opened up new fields of research and experimentation in the world of chemistry and of medical science. In fact, it marked a new advance station from which the exploring scientific imagination, figuratively speaking, might press on to additional finds.

As will be noted, Germany enjoys the distinction of discovering both the original X-ray and the substitute therefor.

'YLE OF MUNICIPAL BUILDING

By

F. G. MOORHEAD

Municipal Building
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gardless of the differ-
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mission plan of gov-
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of the new style of
g. The striking fea-
oines structure is that
partments of the com-
it are housed together
:he size practically of
, with every city em-
t, ensconced at desks,
of any modern bank.
id the mayor, the com-
, the commissioner of
ssioner of finance and
all the employes of the various departments, with a large cage for the city treasurer occupying the most prominent position in the room, immediately at the head of the grand stairway. There is a private office for each of the commissioners and a separate chamber for the meetings of the council or commission, but aside from this, whoever the taxpayer is looking for is to be located immediately, within plain sight, and accessible without the red tape formality that used to hedge in the old style city "boss" from the taxpayer and private citizen.

The new Municipal Building was built at a cost of $350,000 and is remarkable in that it was finished for something like $48,000 less than the amount of money voted for the purpose by the taxpayers.

On the first floor are located the engineering department and the department

of public safety, while a press room—equipped with telephones, typewriters and reporters' desks—is a novelty much appreciated by the scribes. The heads and all the employes of each of the four departments—comprising all the city government, except the public safety department found on the first floor—are

fairs of the city as in ban
or any private concerns
thing, however, the comm
be found at their desks
square of the departme
sible to the ordinary cit
telephone exchange, w
phones in the building

PUBLIC SERVICE ACTUALLY ADAPTED TO THE PUBLIC'S NE
The various departments in the new Municipal Building at Des Moines are arranged with all
convenience of a bank.

found on the second floor, each department railed off in a quarter of the great room, so that there need be no confusion in finding any employe, no matter how exalted or how humble. The private offices of the commissioners are used only for the personal conferences as absolutely imperative, at times, in running the af-

departmental communic
one end of the main roon
is the Hall of Records, w
end is the Council Cha
for 100 spectators.

The third floor of the
over to the legal and civi
ments.

ERHAPS, BUT HERE'S WHERE A TYPHOID FEVER EPIDEMIC STARTED.
llowed the germ-laden drainage from the Coatesville hospital to drip into the mill race which
nergency pumping station. This polluted water was sent, without filtration, into the water
wn of Coatesville. The new filtration plant ordered by the State Department of Health is at
hospital at the left, on the hill. Resolute action brought about the change.

NG HEALTH UPON A TOWN

By

RTHUR ST. GEORGE JOYCE

fternoon recently, in the
: town of Coatesville,
nsylvania, a man walked
a silk mill—the town's
n c i p a l manufacturing
to see the proprietor.
ne hour to shut off your
demanded the visitor
ner appeared.
ected the startled mill-

he 'buts'," retorted the
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ler penalty of arrest."
the visitor displayed a
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rds: DEPARTMENT
)F PENNSYLVANIA.
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ve no water for drink-
for any other use.
r—a physician of the
partment of Health—
ll owner that the busi-
ussing was very serious

and that with him it was a matter of life and death. He summoned two inspectors who accompanied him and together they went to the intake pipe through which the water in the silk mill pumping station was being pumped. They cut the connections, tore out the machinery which pumped the water from the mill race to the station and then cut off all connection between the plant and the Coatesville water supply pipes.

The physician and his aides then hurried to the town reservoir and gave instructions to those in charge to have the water pumped out. Despite threatened interference on the part of the borough officials the health officers demanded that no water be sent through the supply mains until it had been "treated" with copper sulphate and hypochlorite. Engineers connected with the State Health Department began at once the installation of a treating plant and every gallon of water that was thereafter pumped through the mains had been "treated" by this plant.

The town officials were then looked up

and implicit instructions were given them to at once begin construction of a modern filtration plant and to have filtered every gallon of water that went through the Coatesville mains. There were protests and the officials insisted that the town had no money on hand for such an improvement; in fact, there was no need for it and it "wouldn't be done."

"It must be built, and at once," they were told.

Plans were handed them and it was explained just what sort of a filtration plant the State wanted built. The officers of the town were told that to interfere with the Department's work meant possible imprisonment, and so insistent were the health authorities that a special meeting of the town council was called, an appropriation was voted for the new plant and in the course of two months it was put up in accordance with plans mapped out by the State Department of Health. Interest of the Department did not end, however, with the awarding of the contract. The Health Department engineers stuck to the job until the plant was finished and turned over by the contractor to the town officials.

The determined show of the Health Department is what saved the town of Coatesville from one of the worst epidemics of typhoid fever ever witnessed in the State of Pennsylvania. As it was, the carelessness of the town's authorities in not seeing to it that this program was carried out a year ago—two years ago, in fact—indirectly caused the death of thirty-two of Coatesville's citizens and developed more than 500 cases of typhoid fever in a few weeks.

For Coatesville had been warned twice by the State Health Department that such an epidemic was upon it. The officials of Coatesville were too busy with factional politics to listen to the warning, however, and it finally came time for the State Department to step in and force action.

The Department, fo
break in Coatesville la
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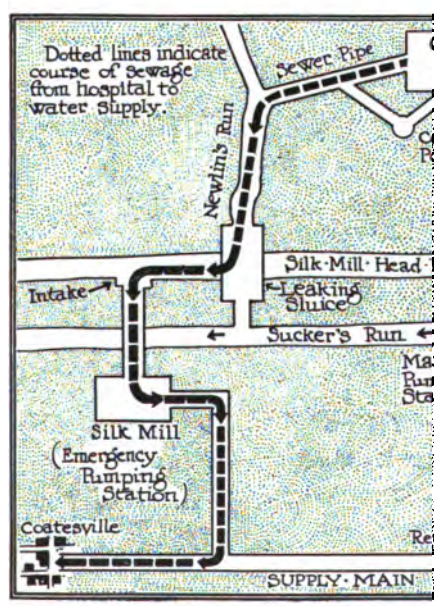
The Department's aut



FROM HOSPITAL TO HOME
How the people of Coatesville, unconscious of t
drank sewage with their wate

TYPHOID INFECTION SOURCES WITHIN A FEW FEET OF THE COATESVILLE RESERV
The Pennsylvania State Health Department ordered this condition wiped out.

VISITING NURSES GIVE ADVICE FOR THE CARE OF PATIENTS AND THE DISPOSAL
WASTE MATTER.

in this respect. No man has any word to say in opposition to its orders. Not even has a property owner any rights in his own home which supersede those of the Department.

The Pennsylvania Department is probably the only bureau of health in the United States which has developed the science of war upon disease to such an advanced stage as to organize as its principal adjunct a Division of Sanitary Engineering. Until the formation of the engineering department under the supervision of its "engineer-in-chief," Dr. Samuel G. Dixon, expert scientist, student and man of medicine, the proposition to associate the science of engineering with public health improvement never entered the minds of those whose business it is to guard the health of a community. The work of the latter was confined largely to the distribution of pamphlets telling how to guard against disease and to doing what they could to give physical relief to communities which happened to have been stricken with epidemics of one sort or another.

INSTALLING THE NEW FILTRATION PLANT AT COATESVILLE UNDER DIRECTION OF STATE SANITARY ENGINEERS.

The Coatesville epidemic was caused primarily through a violation of a law governing water supplies of cities and towns laid down by the State Department as one of its most important restrictions for the prevention of disease. The Borough Council of Coatesville failed to report to the Department that it had arranged to put into service an emergency pumping station at the silk mill in the event of the station proper becoming disabled. Of course, it was not figured that the unexpected would ever happen, and the councilmen consoled themselves with the belief that the main station pumps would always do their work properly. They did not place much stock in the theory that the emergency station would ever be needed and, therefore, they did not consider it worth while to report the existence of the secon paratus to the State I quired by law. Henc which should have be the method of construc of the emergency stati it until the epidemic ha ville.

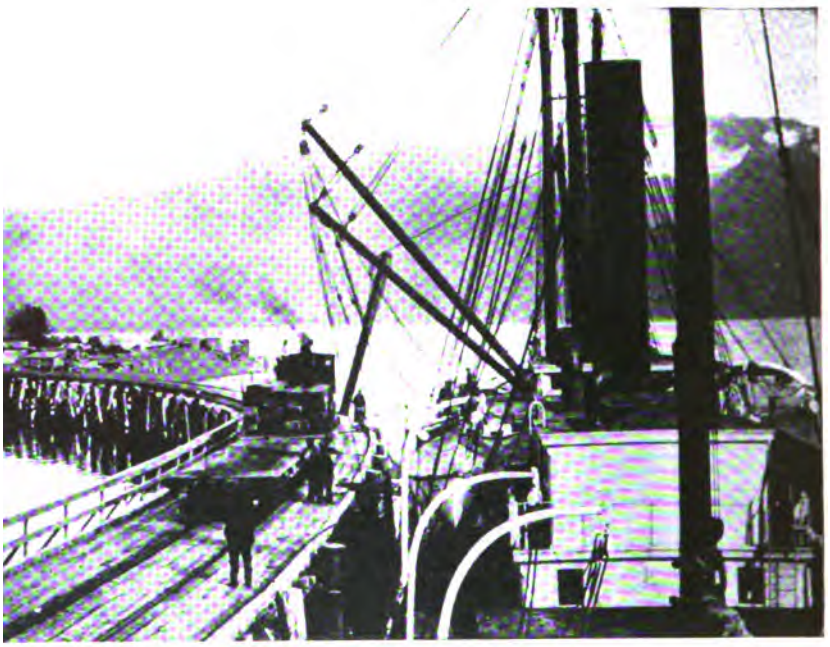
The unexpected did uary. Two pumps in got out of order and people of Coatesville d into the town' the emerg auxiliary being perf an o

Coate a valley on a pr Coatesv From are sew that r what is called Newlin'

The sewage continu the hillside, crossing supplies water to the emergency pumping st

Now Sucker's Run i which the town of C water supply. Eight gallons is carried by ment into the Coatesv

But when the pumpi of gear on January 14 ordered the water pu emergency station in t on Sucker's Run, to germ-laden Newlin's no filtration plant in t result was that throug silk mill plant there the water from the m had dripped polluted the Coatesville Hospi typhoid fever appeare



KA, FROM WHICH IT IS PROPOSED TO LAY THE "TRANSPORTED" RAILROAD INTO THE INTERIOR.

VING A RAILROAD SIX THOUSAND MILES

By

RENÉ BACHE

Secretary of the Interior
ors a trunk line, in Alaska,
n tidewater at Resurrec-
Bay to the valley of the
con, connecting that great
vay with the coast, and so
. It will be a government-
l.
isher calls attention to the
aling station has already
ed by the Navy Depart-
rection Bay, and urges that
it of a harbor and the con-
a railroad starting from
outhern terminus, to pass
ough the Matanuska coal
e justified by military and naval, as well as commercial, considerations. Incidentally, it would open up the great agricultural possibilities of Alaska.

The most interesting suggestion he makes, however, is that much of the contemplated railroad and its equipment shall be transferred from the Isthmus of Panama by water, a distance of nearly six thousand miles, to Resurrection Bay. For it appears that, incidentally to the digging of the ditch, the Canal Commission has had to construct and operate many miles of road for which there will be no further use when the job is finished. An immense amount of material and equipment—rails, locomotives, cars, etc.—will have to be sold at junk prices unless it

is utilized in the way now proposed.

The canal-digging job is so nearly finished that the surplus machinery and material can be released at Panama as rapidly as employment for it is found in Alaska. It includes excavating and wrecking outfits, steam drills, pile-driving machines, etc., well adapted for the construction of the proposed railroad. There are 250 miles of seventy-pound rail which has been in service on the Isthmus from three to four years, having originally cost $31 a ton. Fifty miles of this will be available for shipment by the end of the present year; one hundred miles more can be released six months later, and one hundred additional miles a year after that. For an incidental item, there are one thousand switches, complete.

SOME WINTERS THE SNOW BANKS UP AROUND HOUSES IN ALASKA LIKE THIS.
The tunnel was dug for exit and entrance.

Twenty-four locomotives, bought in 1906, at $11,000 apiece, are to be retired from service June 30, 1913. They are of

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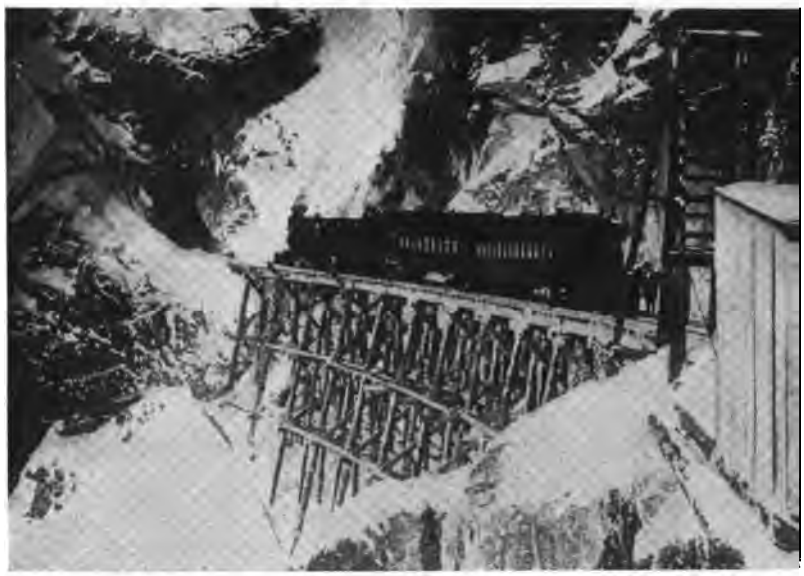
and extensions in coal where.

Five hundred steel flat $881 apiece in 1905, cou standard gage for $27.50 also eighteen hundred b cars, and sixteen hundred which cost $1,110 each expense of converting th There are no box cars, no passenger coaches. steel flat cars could be ea into gondolas, for car some of the wooden fla redecked and made ove



ON THE WHITE PASS AND YUKON RAILROAD, WHICH FOLLOWS THE HIS THE GOLD DIGGINGS.

THE FAIRBANKS-VALDEZ STAGE—WHICH FOLLOWS THE ROUTE THAT MAY BE A
FOR THE TRANSFERRED ISTHMIAN LINE.

and bunking and mess cars, and for any other necessary purposes.

All of this material could be carried by water to Resurrection Bay at very moderate cost, if Congress—as is confidently expected—permits. It would save a great deal of money, and, wh less important, would vastly exp building of the proposed railroa other suggestion likely to be ca is that the engineering and organization now on the Isthmu

THEY WILL DRAG SLEDGES WHEN THEY GROW UP, BUT NOW THEY ARE ONLY
MONTHS OLD.

otherwise must soon be disbanded, shall be transferred to Alaska for the carrying out of this new enterprise.

Alaska, a region of incalculable resources, one-third as large as the United States, possesses at the present time a total population of only 64,356 souls—about half of these being natives. Of the white people, hardly any expect to make their homes permanently in the Territory; they regard themselves as aliens.

This remarkable state of affairs is due mainly to the fact that the development of the country is held back by lack of transportation facilities. Winter travel nearly everywhere in Alaska is still of the roughest pioneer description, and

starts from Cordova
Sound, and runs tw
the Copper River to
field. It cost $20,00
railroad. The Alask
Seward along the lir
for the contemplated
road. It ought to
River to Fairbanks,
aged seventy-one mil

Strange though it
a good deal of opp
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ple are of opinion
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FAIRBANKS, THE OBJECTIVE POINT OF THE PROPOSED R

those who visit the Territory go there with the expectation of enduring much hardship, picking up as much money as possible in a short time, and getting out again.

But Alaska at the present time is not wholly devoid of railroads. The Tanana Valley road—the Tanana is a branch of the Yukon—starts from Fairbanks and runs forty-five miles to nowhere in particular. Its president, Falcon Joslin, is anxious to connect it with something that goes somewhere. The White Pass & Yukon Railroad is a good narrow gage line which follows the historic trail that leads over the mountains and down the Yukon to the gold fields of the Klondike. But only a small part of it is in the territory of the United States.

The Copper River and Northwestern

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BLACK MAGIC FINDS WATER

By

RICHARD HAMILTON BYRD

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SCIENCE LOCATED THIS. Artesian gusher at Woonsocket, S. D., that spouts one hundred feet above the ground.

he would come to Edgemont, make a study of the surrounding country and advise them what to do. Instead, the geologist answered the company, after a few days' consideration of his geologic data, that if they would drill three thousand feet they would get a fine flow of fine water. Darton had been at Edgemont and he knew how the great artesian stratum—the Dakota sandstone formation—must lie, with reference to the surface at that point, and three thousand feet was his guess to water.

Well, there is generally known to be a water basin under South Dakota and most anybody could guess three thousand feet; if water was struck at any point after going one thousand or fifteen hundred or two thousand feet, why, the guesser could say with swelling pride: "I told them to drill that well, and see what they got!" But Darton said three thousand feet. He didn't say fifteen hundred or more; he said three thousand.

The drilling began. Night and day, drove the relentless diamond point through the earth and rock. Formation after formation, stratum after stratum, as shown by the drill core, was pierced—sixteen hundred feet; two thousand feet—dry as a rat's nest. "Nonsense! rot!" said many of the Burlington people. "Quit such monkey

business; half a mile down toward China and nothing damper than at the surface—excepting on the enthusiasm of the drillers. How about it?" they wrote the geologist. "The prospect hole doesn't look good."

"Keep drilling" was the reply, in effect. "I said three thousand feet. Now that you are nearing the twenty-eight hundred feet level, I may caution you that you will strike some water at about 2,920 feet in the red sandy limestone of the Carboniferous formation; but keep on through; that isn't the main flow. Drill three thousand feet."

At 2,918 feet a considerable artesian flow was struck and a loud hurrah might have been heard around Edgemont. Darton received a congratulatory telegram on the accuracy of his first guess.

Down, down, still down drove the drill—2,950 feet; 2,975 feet, but no more water. Still the drilling continued.

"At three thousand feet," Mr. Darton had said, "you will be well into the Dakota sandstone stratum, and that means water at Edgemont." And at 2,980 feet came a flood such as Edgemont had never dreamt of.

"You Will Find Water at 2,920 Feet," N. H. Darton, of the Geological. Diggers at Edgemont, S. D. They Found

A fairly good guess? Less than one per cent of error!

This, however, is not quite all of the story of Edgemont. Mr. Darton was warmly congratulated on behalf of the Railroad, by the official who had discovered him. Being in Uncle Sam's employ he couldn't of course accept the handsome honorarium tendered him by the company; but fast following on the heels of the tidings of victory came a message over the wires shrieking dismally as it conveyed the dire intelligence that the water had proved bad. After three thousand feet into the breast of Mother Earth and tapping nature's fountain, the water encrusted the engine boilers. It couldn't be used. "Is there any Mr. Geologist, or shall 'Darton's Folly'?"

"Don't become exc scientist. "Your first struck in the red beds doubtedly contains calc it has followed the pi pregnated the main from the Dakota stratu down a casing inside y you will cut off the lim

Correct again!

The Edgemont well flow of any of the v wells in the United S "luck," though, gettir way?

ɜISLATURE CALLED TO FIGHT TINY FLY

By

ARLTON LAWRENCE EDHOLM

'E FLY, smaller than the
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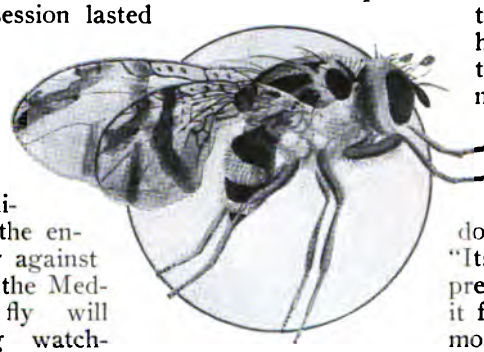
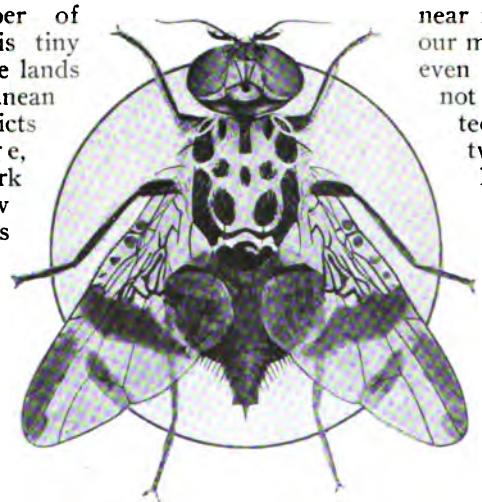


MALE—MAGNIFIED.



FEMALE—MAGNIFIED.
THE PEST THAT CAUSED A SPECIAL SESSION OF THE CALIFORNIA LEGISLATURE.

Once introduced, it seems almost impossible to exterminate the fruit fly, hence it is necessary to guard most rigidly all points of entry, inspecting all fruit shipments and nursery stock and even making search of personal baggage of tourists.

So prolific is this pest that a single tropical fruit, brought home by a tourist as a tid-bit for his friends, might contain a sufficient number of the tiny maggots to destroy our fruit industry, or cost us millions of dollars to combat it.

"Its terrors are better appreciated as we learn that it fattens on a score of our most p r i z e d and valued fruits; all our citrus fruits, stone fruits, apple and its near relatives, and some of our most valued vegetables; even beans. Our fruit crop, not including beans, netted us one hundred and twenty-five million dollars last year. Imagine this sacrificed to the greed of a small fly and the gravity of the situation is alarmingly evident. We simply m u s t keep this scourge from our shores." In these words Professor A. J. Cook, California S t a t e Horticultural Commissioner, pays his respects to *Ceratitis*

Capitata, the name by which scientists know the lively little insect.

As a result of his energetic work and the co-operation of a progressive legislature and governor, the desired bills were passed and the sum of ten thousand dollars was appropriated to combat the pest in the Hawaiian Islands. This, added to the fund of $8,750, will be used in the groves of Hawaii to check the increase of the fruit fly as far as possible. The latter sum was raised by progressive planters on the islands, more as a contribution to the general welfare than as a direct benefit to their own interests.

The situation there is peculiar: the Hawaiian fruits of any commercial value are the banana and pineapple, and these have so far been immune from the pest and may be freely imported. The fruits which harbor the maggots, such as the mangoes, guavas and other tropical products, are not exported to any great extent, do not represent any commercial interest in the islands and, therefore, the Hawaiian fruit growers would have been justified in remaining indifferent to the presence of the fly. They deserve credit for raising this fund to combat a pest which threatens the mainland, and it was in recognition of this that California appropriated ten thousand dollars for the work over there.

THE HOME OF THE PEST.
In Hawaii, the mountains are covered with wild fruit trees that harbor the destructive fly. This makes it almost impossible to check the spread of the insect.

PROF. A. J. COOK, OF THE CALIFORNIA ST
OF HORTICULTURE, WHO DECLARES
UPON THE MEDITERRANEAN F

Mr. E. K. Carnes was sent as special agent to the islands to study the life history and habits of the Mediterranean fruit-fly and to do experimental work that would assist both in keeping out the undesirable insect and eradicating it in case it should by some chance elude the quarantine. He describes the "female of the species" for the benefit of the fruit grower, so that it may be readily recognized may chance to come.

"The fly is slightly sm
house fly, and is strikingly
of the same general shape
the abdomen ends in a shar
general color is yellowish,
black and white markings

POSED TO STATION INSPECTORS IN HONOLULU HARBOR TO PREVENT THE EXPORTATION OF INFECTED FRUIT.

ɔrax. At first glance, the
ɛteristic feature that would
noticed by the average grow-
ɛh would quickly distinguish
from the common house fly,
arly banded wings, which are
ɜparent, and each one is
h four irregular yellowish
hes, one at the base and the
on the broad part. The ab-
ll yellow, with two silvery or
sh bands crossing it. The
is more or less hairy, and
rries its wings in a peculiar
anner. The eyes are dark
l the legs are dull yellow."
ty little creature is quite as
ıe is attractive when she flits
fruit to fruit making tiny
which she deposits her eggs.
op into white, pointed mag-
half an inch long and they
ect of softening the pulp and
fruit to ripen and drop be-
ɛ. Usually it bursts and the
released. As they are quite
is stage, they spring about
ɔ place and seek an opening
which they enter. Within a
ıey change into the pupæ and
ge as adult flies. The whole
ɔm egg to parent fly is about
: days in Hawaii.

es states that from the first
ɔes which he bought from a
in Honolulu, he took twelve,
nd eight maggots, respect-
at wherever ripe or decaying
ınd, the pest was in evidence.

In connection with Mr. Carnes' work he installed an experimental station in a small hot-house where he placed infested fruit in glass jars in order to study the development and life habits of the *Ceratitis Capitata.* The experimental jars were covered with gauze and had a layer of sand or soil on the bottom, so that as the flies passed from stage to stage it was possible to observe the effect of the insecticides for their destruction.

A careful inspection of the orchards in various parts of the islands was undertaken, involving many miles of travel aside from the main roads and an investigation of the wild fruits which harbor the pest. The latter feature seems to present an almost hopeless problem as far as the eradication of the fly in the islands is concerned. For instance, the island of Oahu contains many thousands of acres of what is practically jungle, a dense growth of wild guava and other fruit-bearing shrubs, which produce ripe fruits in abundance all the year round. The decaying specimens under the bushes were alive with maggots, and when one considers that this island alone contains six hundred square miles, the greater part of which is mountainous land, it will be seen that it is a gigantic task to fight the pest under such conditions.

Ranking next to the wild guavas, the most hospitable of the "host fruits" are those grown about the houses of the natives and residents of the islands.

Practically every house or native hut has a clump of fruit trees and these often grow to enormous size, making fumiga-

tion or other control very difficult. They embrace the variety of fruits that are sought by travelers for curiosities "to bring home to the folks," and the danger from this source is extremely grave. A single fruit dropped upon the dock at San Francisco could liberate enough maggots to menace, or even possibly destroy, our fruit industry, as they could find hiding place in the crevices of the wood where they would quickly develop into adults and begin their work of destruction. For the reason that even during inspection at the docks it might be possible for the insects to be liberated, it was considered desirable to remedy the defect in the quarantine law providing for the examination of baggage and consignments of fruit in port. The right of search, therefore, was extended to the three-mile limit, thus making it possible to destroy all infested fruit before it could reach the mainland. In June, 1911, the quarantine became effective against all fruits imported from the islands, except the banana and the pineapple, which appear to be immune. Because of the ignorance of the general public regarding the terrible risk involved and the perversity of some tourists who like to show that they are "smarter than the inspector," attempts are made to slip through a few specimens and occasional consignments of affected fruit are received, which are at once destroyed. Even the wild native grasses which are used as packing materials about shipments of bananas and pineapples are now barred, as many of the wild grasses used for that purpose grow in infested districts and are likely to contain the insect in th Excelsior and clean rice s packing used at present.

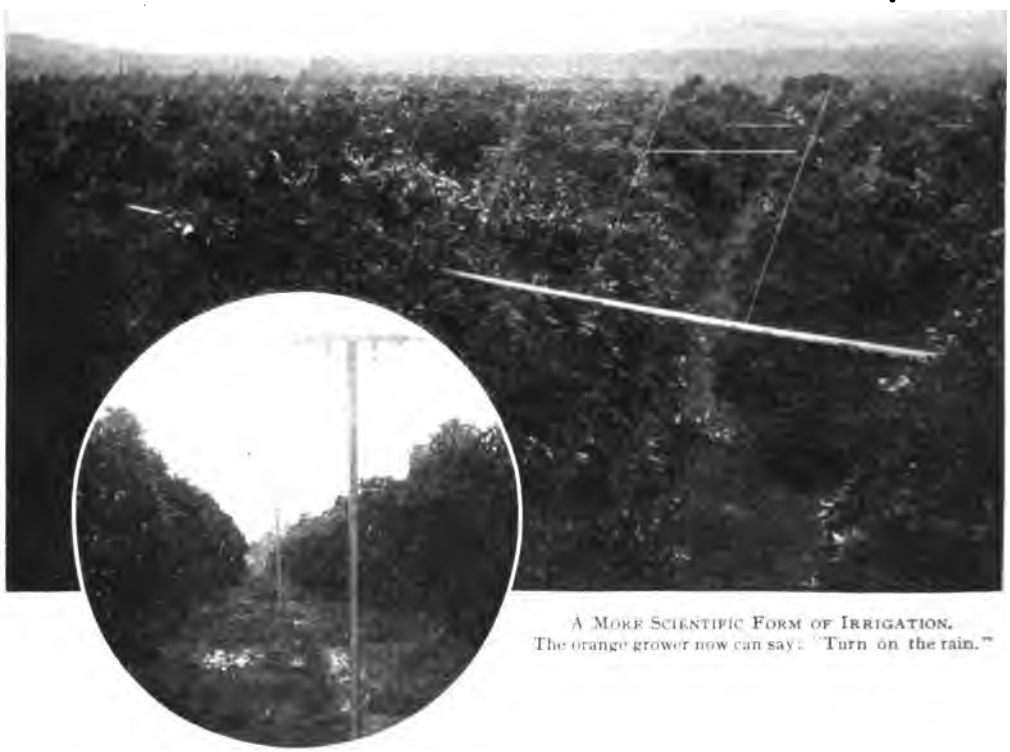
It is now proposed to pla tural inspector at Honolul infested fruit from the sh San Francisco or even fr where these ships for San loaded.

Another method of c pest in the islands is the ins oil-burning garbage cremat the affected fruit is destro

Measures are also being vide protection for consign waiian fruit brought into railroad from states farth also from the still remot British Columbia.

Speaking of the dollars volved in combating impor following statement from Bulletin of the California S sion of Horticulture cont which is startling to the payer:

"When we stop and cons per cent of all our injuri from foreign countries, and per cent includes such insec sian Fly, Codlin Moth, Sa Gipsy and Brown-tail M Cushion-Scale, Cotton Bo Alfalfa Weevil, and many tant pests, and that the a fighting injurious insects States reaches $1,000,000,(get some idea of the value those pests which are no our very doors."



A More Scientific Form of Irrigation.
The orange grower now can say: "Turn on the rain."

RAIN-MAKING FOR THE ORANGE GROWER

By

ROBERT ANGUS MACK

MUCH more poetical, and infinitely more beautiful than the old-fashioned, prosaic "ditch" irrigation is a revolutionary system of applying water to orange groves which is now being worked out in the Porterville orange district in California, in which the orchardist actually "makes it rain" at will, with every indication that the result will be nearly, if not quite, as beneficial to growing and fruiting trees as the gentle moisture which falls from the clouds during the California rainy season.

Described in a sentence this system, which has been installed by Robert Baird at Winterhaven, in the Porterville foothills, consists of a series of nicely graduated, galvanized iron water pipes, carried above the tops of the orange trees, there being upon these pipes, at intervals of a few feet, specially constructed sprinkling nozzles through which the water is forced under pressure. Consistent experimenting was necessary to arrive at the proper distance apart for the main pipe lines, the distance between the sprinklers and other details, but as the system was finally installed, water is uniformly distributed over the entire orchard, with

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enveloped in a fine
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temperature of which in the irrigating well of this particular orchard is about seventy degrees, Fahrenheit. No frost that has ever been known in California would cause even the slightest damage against such opposition.

Mr. Baird's first idea of this system came through careful observance of his orchard and the development of the fruit. He noticed that when the rainy season set in especially early and when a brisk shower soaked the orchard just at the time when the vivid-green orange was turning to a bright golden color, the fruit matured from ten days to fifteen days earlier than in those seasons when the orchard was dependent upon ditch irrigation. This set him to experimenting with single trees. He was soon convinced that there is some subtle effect upon the vigor of the tree when it is thoroughly wet, probably upon the same general principle as the invigorating feeling when a tired man takes a bath. At any rate the early rains produce the early fruit, and now the Winterhaven orchard is so equipped that the early rains can be controlled at the will of the owner of these fruit lands.

As the Winterhaven plant has been installed, ten acres is covered in a single unit. The orchard contains about 120 acres of orange trees, and twelve units will therefore be used in irrigating the entire orchard. One man can handle each unit easily, making a very appreciable saving in labor cost, as three or four men are needed to keep water running through ten acres of ditches.

There are no patents on this system of water distribution as it has been put to use in the Porterville orchards, and anyone can install it with such tools as the average rancher handles every day. All that is needed is a line of stand-pipes running centrally through the orchard, as feeders from which to run the pipes carrying the sprinklers. Each sprinkler line is provided with a sliding valve and a handle by which the sprinklers are set at a varying angle, so that the orchard may be covered uniformly, or it would be possible for an ingenious orchardist to equip his system with a small motor, with clockwork attachment by which this work could be done automatically.

The Woolworth Build

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A TEST FOR THE NEW PULSE FEELER.
to be the world's loftiest skyscraper, in the course of construction, New York City.

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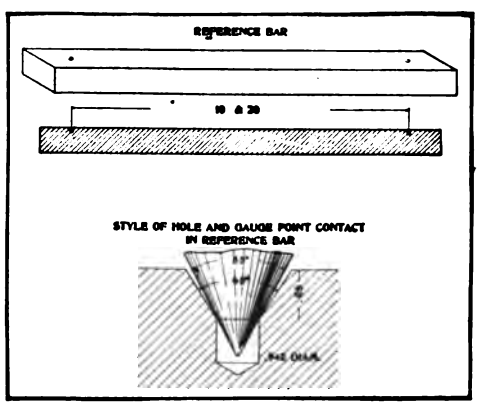

DIAGRAM SHOWING THE PARTS AND METHOD OF APPLICATION OF THE NEW STRUCTURAL TESTER.

ton, has invented what may be called a clinical thermometer, or a pressure-gauge, or a pulse-recorder, as you like, for the sky-scraper. With it he is diagnosing the diseases of buildings, bridges, boilers, columns, pavements — and all their inanimate but not immune relatives.

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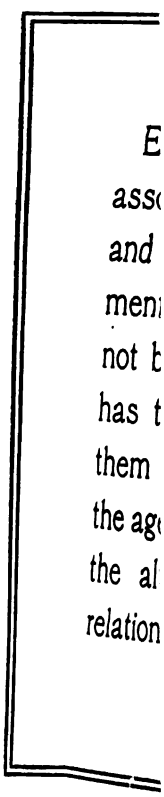

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It is startling, even to the person who doesn't know anything about a fraction of the dangers. So, even the novice can grasp a part of the value of the gauge that tells the truth to fractions that are invisible to the human eye. Also, the novice can then conceive something about the credit that is due to the fellow who devised that gauge and the method of handling it.

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INTERIOR OF MISS LYONS'

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of those who had no
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their equipment. After such members had secured a house and their land was cultivated and stocked, they were expected to pay back the loan in installments of $5 or $10 a month so as to enable other members who might want to make additional improvements to have the use of the money.

But even with this fund, there was not money enough available to enable every family to occupy its acre the first winter. Several families merely camped in tents the first summer, the father holding his job in the city and going back and forth. The rest of the family (mother and the boys and girls) worked on the land, getting out the stones and witch-grass, planting, weeding and cultivating. Oftentimes such a member, earning his weekly pay-envelope and finding his living expenses reduced, was able to hire another member—who had some spare time on his hands—to dig his cellar or build his henhouses or beehives.

Thus started, the family moved back to the city for the winter. The following season they began where they left off—that much ahead of the game. At the present writing all the members, save three, are all-the-year-round residents. And one of the members has grown so enthusiastic that he has created another Fellowship of

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MISS FRANCES LYONS BUILT THIS HOUSE WITHOUT ANY ASSISTANCE WHATEVER.

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and merely social. Th
Association, George I
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ited, dividends paid an
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The manner of life tha
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This principle
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stock for commercial return. Allowances are made for individualism. Mr. Littlefield happens scientifically to have studied agriculture and is, therefore, able to extract the utmost radish and squash from his acre. Chiefly, however, he is a printer. He has built a print-shop alongside his home, where he gets out a monthly magazine and job-work. He furnishes employment, on an inside co-operative basis, to a printer (a single member who built his house out of two packing cases at a cost of $16.00); to a lithographer, Arthur Siebelist, who has the honor of being father of the first baby born on the Farm; and to Frances Lyons, an illustrator.

Miss Lyons is a student of arts and crafts as well. She camped in a tent while she built her home, "Studio House," almost entirely by herself, having help only with the heavy timbers.

This allowance for individuality has evolved several inside co-operative plans, quite apart from those of the Association. A retired school teacher, who had a pretty single-room house built with some of her savings, is not strong enough for outdoor work. She buys the supplies and does the cooking and housekeeping for three single members, who cultivate and care for her acre in return. Also, the egg-raising members have combined and employ a member with more of a business than an agricultural bent to market their output.

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on that is equivalent to entire country southward wenty degrees of latitude. ts of note both in Europe affirm that this derange- rological conditions, affect- rn as well as the northern iator, is working in a cycle, es to reach its maximum year. Therefore, we may r torrid summer, followed cold a winter as shivered

DOES THIS SUGGEST ALASKA?
A liner at Sunny Point, in the southeastern part of the peninsula, the past winter.

ion timbers east of the Rocky 1911-12.
/ear the meteorologists are have a larger grasp upon er. Long ago they learned cannot be studied locally, oad sweep of a continent, at ssary for intelligent observa- en this is insufficient, and the ion will see all the important globe linked together in an weather bureau that will be assisted by daily wireless reports from every ship upon the sea.

Present facilities are inadequate in tracing the rise and progress of those troublesome storm centers. North America is particularly concerned in the storm centers that originate somewhere in the Orient—probably as overgrown typhoons —sweep around the northern border of the Pacific, across Western Canada, and exhaust themselves in the vicinity of the Great Lakes. This, at least, is their normal path. But just lately some cosmic or extra-cosmic force has thrown them far to the northward, and at the same time—undoubtedly the conditions are related—has brought northward and expanded the normal high-pressure atmospheric zone that should center in the Atlantic Ocean off the coast of the South Atlantic States.

"The shifting of the storm centers northward gives Alaska a warm winter, and the variation in the high pressure belt gives the Eastern States a super-

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New Chamber of Commerce, Seattle. "The latest and most accurate isothermal maps of North America show that the isothermal line of thirty degrees passes through Seward, Valdez, Juneau and other towns along the Alaska coast, swings far to the southward, hugging the coast, passes through New Mexico, and on out through New York City.

"New Yorkers would find it hard to believe that their climate averages up with the Alaska coast.

"The isothermal line of Nome and the Yukon Valley runs down into the Dakotas."

Little or no snow fell along the Alaska Gulf coast up to the first of January, 1912, and in early March the official spring clean-up of Juneau was in progress, it being the custom of the Alaskan capital to wash down the sidewalks with the fire hose each year as soon as the snow has melted. By the latter part of March the winter trail was breaking up between Chitina, on the Copper River & Northwestern Railway, and Fairbanks, stranding large shipments of supplies that were going over the snow on sleds.

February in Dawson was so mild that the oldest inhabitant didn't have courage to open his mouth with stories of the past. By the beginning of March the happy Dawsonites were bringing in garlands of pussy-willows. An open air dance was given on the fifteenth of March.

Even last year the climatic change was beginning to be felt on Bering Sea, for the ice was thinner and went out several weeks earlier than usual; this year navigation on Bering Sea was open fully two months in advance of the average for the last decade.

Another strange feature of Alaskan conditions is the fact that glaciers that have been quiescent for long periods of years—perhaps half a century—are wakening into life, and are moving at surprising speed into the sea. The year of 1910 was marked as the beginning of this era of motion, and some most interesting observations were made during that season by Professor Lawrence Martin, leader of an expedition sent out by the National Geographic Society.

The Martin expedition found that Barry Glacier, in an arm of Prince William Sound, had retreated three miles since it had been explored and mapped in 1899 by the E. H. Harriman Scientific expedition.

In 1911 another movement was apparent in most of the glaciers of the Alaskan coast, and the climatic conditions of the last winter may determine the question perplexing geographers whether the advance and retreat of glaciers is due to climatic effects, or to some other cause, possibly earthquakes.

The theory of the storm centers as changing the climate of Alaska and the North Pacific Coast—for British Columbia, Washington, Oregon and California have also had an unusually pleasant winter—does not altogether satisfy all the navigators and local observers. Their theory is that volcanic action, perhaps coincident with the earthquake shocks just mentioned, disturbed the currents of the sea, shifting the warm Japan current more directly to the eastward, and intensifying its temperate influence upon the American shore. Shipmasters in steaming from Seattle to the vicinity of Cape St. Elias, steering by dead reckoning all the way, found themselves fifty miles ahead of their log, and observed that the water was warmer than usual.

But the weather bureau officials do not put much stock in this supposition, for, they say, "the old physical geographies were wrong in indicating the Japan current as sweeping around the northern border of the Pacific, and warming all the adjacent shore; the truth of the matter is that the Japan current does nothing of the kind. It disappears three or four hundred miles after it leaves the coast of Japan, just as the Gulf Stream disappears a short distance after it passes beyond Newfoundland, though it was once supposed to cross the Atlantic, and warm the British Isles.

"The temperate climate of the upper Pacific Coast is due to the winds which blow in from the Pacific Ocean, which is warmer than the land. The chill winter climate of New England is not due to the so-called Labrador current, but to the prevailing land winds. England's mild climate is not attributable to any ocean current, but again to the prevailing southerly winds from the warmer ocean."

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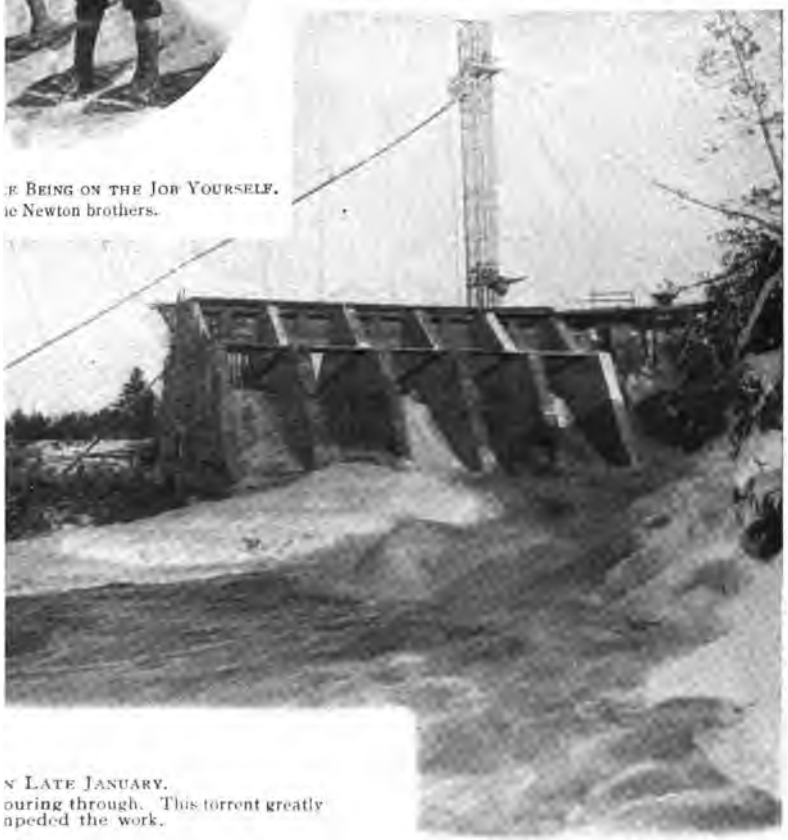
ment, while the canal for the power house had to cut through the solid rock forty feet wide, twenty feet deep and over three hundred feet long.

The start in the concrete work was begun by pouring from a portable hundred-foot steel tower built of interchangeable units. This tower was the first of its kind in this sort of work, the owners say, and has proved very successful. The complete electric plant, with generators run by steam power, among



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other things operated the mixer which dumped directly into a hoisting skip bucket that handled a ton at a time.

This skip bucket dumped into a hopper in the tower, which poured the mixture into place not only on the Wisconsin side but from end to end of the dam, through a long jointed line of pipes held by steel cables. The possibility of mixing concrete in Michigan and building with it in Wisconsin is a feature of interstate commerce not probably heretofore con-

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perature of the mixing materials the work could have been continued in even colder weather," said one of the Newtons, "but it would have been too hard on the tower men."

Working on an open frame steel tower in fifteen below zero weather calls for a good constitution and plenty of warm clothing. The tower men, one of whom was stationed above the hopper near the top of the tower, cleans the hoisting bucket each time, and another, on a platform a little lower down, operates the hopper gate and lets the concrete discharge into the pipe line. These workers were bundled in hooded sweaters, canvas wool-lined coats, heavy pants, leggings, socks and shoes. During the coldest weather a canvas screen was thrown around the lower part of the tower for some slight protection at least against the bitter wind which swept down the icy river.

The bottom of the stream or rock on which the work was built was all the way from eight to twenty feet below the water level held back of the cofferdams. The method of handling the water was as follows: as the rock was excavated from the canal it was dumped to form a stone embankment extending out over half across the river from the Michigan shore.

Such leakage as came through this embankment or first line of defense was stopped and diverted by a second line formed of wood sheet piling driven to bottom and made watertight. Water was removed from the cofferdams by pumping and also by the use of a twelve-inch siphon, which, when started, ran uninterruptedly with little attention.

EVERY HOUSEHOLDER HIS OWN GAS COMPANY

By

ROBERT FRANKLIN

FROM this time on, every farmer who so desires may have an independent gas plant of his own, to illuminate his house and furnish fuel for cooking. The convenience, even in remote rural districts, will cost no more than people ordinarily pay for gas; and it goes without saying that the same opportunity offers itself to the suburban dweller, if his immediate neighborhood be not already piped by a lighting company.

There are, indeed, many instances where residents of cities would be glad to gain freedom from the autocratic gas companies. And it is wholly in their power to do this by making use of the new "liquid gas," which is beginning to come on the market, being supplied in steel bottles—the latter refilled as often as may be requisite. Such a bottle, fifty-two inches long and eight and a half inches in diameter, weighs only forty pounds, and holds enough of the stuff to last an ordinary household for a month.

There is no secrecy about the method whereby the liquid gas is produced, and before long it will doubtless be manufactured in enormous quantities — the source from which it is obtained being a waste product of the petroleum wells. The process involved was invented by Walter O. Snelling, a young scientist attached to the Pittsburgh laboratory of the government Bureau of Mines. He claims that the gas is equal in quality to any illuminating gas, while much less explosive than the kind derived from coal. It gives five times as much light as the latter, and has more than four times the heating value per cubic foot.

It should be understood that natural gas is of two kinds—(1) "dry gas," which is the familiar natural gas of com-

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FOR USE IN LABORATORIES.
A bottle contains 1,200 cubic feet of the illuminating stuff.

bushels of coal. There can be no doubt that for every barrel of oil taken from the earth there has been wasted more than ten times its equivalent in heating power, or weight even, of this best of all fuels."

Says Mr. Snelling: "These gases from oil wells, which have up to now been the most difficult to utilize in pipe-lines or otherwise, are the very ones that are best adapted for the production of liquid gas. The new discovery opens to the use of the world the enormous volumes of oil-well gas now so generally wasted, and derives from this refuse material a product which gives to the country home all of the conveniences of gas for lighting and cooking, thus bestowing upon the farm advantages which up to now have been available only in thickly populated districts."

The following table shows the amount of light produced by the new gas for ten cents, as compared with electricity, city gas, etc.—the term "candle power hour" representing one candle-power for one hour:

Liquid gas, 2,200 candle power hours.

City gas, 1,600 candle power hours.

Electricity (Tungsten), 790 candle power-hours.

Acetylene, 640 candle power hours.

Kerosene, 465 candle power hours.

Certainly liquid gas should be welcomed by the householder.

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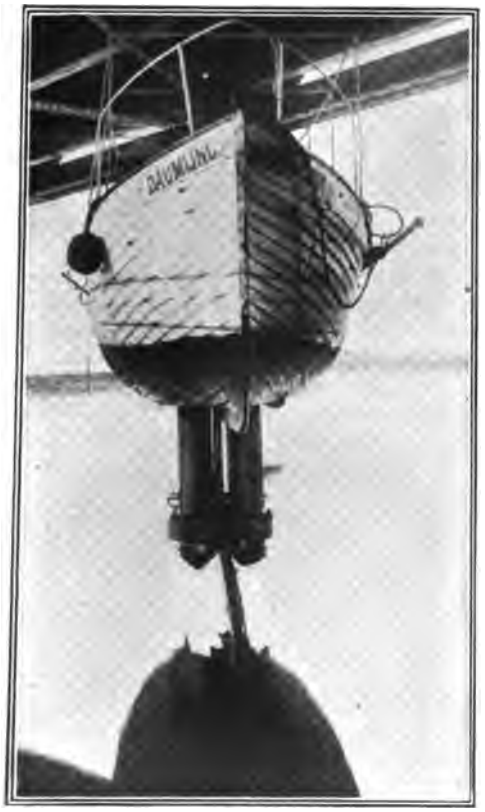

A VIEW OF THE SUSPENDED TUG-BOAT SHOWING THE WHEELS AND RAILS OF THIS VERY UNUSUAL RAILWAY SYSTEM.

lifted to a height of twenty to forty inches by comparatively moderate forces, and comprehensive preliminary tests were required to show the correctness of the inventor's views.

The experimental tug-boat is arranged for electric propulsion and derives its motive force provisionally through a cable, from the power-boat of the canal equipped with a dynamo, which forms part of the tugging train. However, the service may eventually be done by means of a trolley system, similar to those of electric railways. In fact, part of the experimental section of the canal was fitted with a trolley wire stretched out at convenient height above the surface of the water.

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ESTROYER FOR THE COMMONWEALTH OF AUSTRALIA IN THE COURSE OF CONSTRUCTION NEAR SYDNEY.

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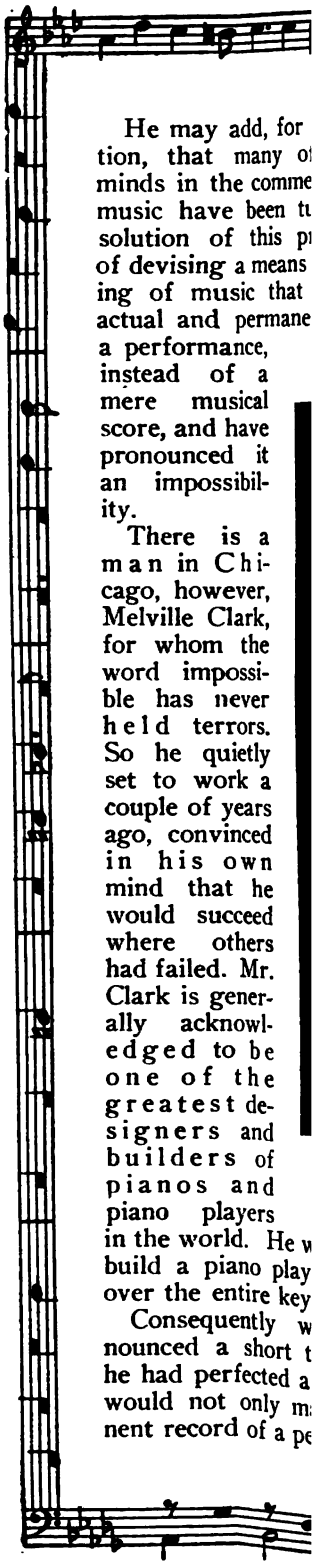
ENGINES FOR THE SMALL ARMS FACTORY, AT COCKATOO ISLAND, SYDNEY.

be able to build a second class cruiser outright, with the exception of certain auxiliary machinery which can be obtained only through the makers. And the cost of production, compared with the imported article, will, the superintendent of the yard declares, be infinitely cheaper.

Since as at critical times there might be some difficulty in obtaining supplies of raw material from the other lands, the great importance of the development of Australia's iron and steel industry is being recognized. The time when the building of a battleship may be undertaken is already anticipated.

There has been so much delay in establishing naval schools in the Commonwealth, that the Naval Board has had to draw upon Great Britain for trained officers and men. More than a thousand men will come out to Australia for from three to five years.



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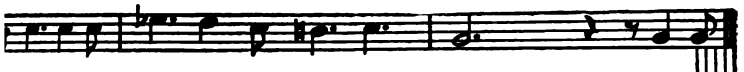

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MELVILLE CLARK.
His invention enables musicians to record their compositions.

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d a device which
make a perma-
ı performance on
a piano, but do it so faithfully and accurately that not a single eccentricity of the pianist's individuality would be lost, the respectful attention of the musical world was immediately forthcoming.

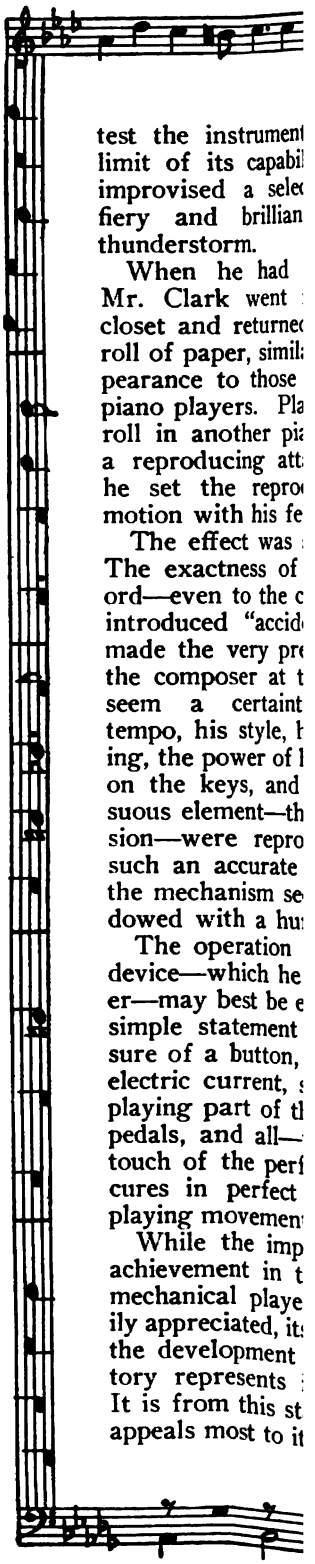
Naturally there were many skeptics — men who desired to be shown. One of these was a pianist and composer of international reputation.

"Of course, Clark," he said, when told of the new invention, "I know you have accomplished wonders in your line. But in this case your claims sound, ah—"

"Preposterous?" said Mr. Clark. "Sure! I don't blame you at all for thinking so. But just come along to my office and see for yourself."

Together they repaired to Mr. Clark's private office, where a piano was in readiness. In one corner of the room stood a little closet. The pianist also noticed that a wire ran from the electric light fixture in the middle of the room into the closet.

"Just a moment," said Mr.



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REPRODUCING A RECORD ON A PIANO PLAYER.
The student gets all the value of the pianist's or composer's composition and individual style of performance.

frankly states that he does not think it has commercial value.

To be able to sit down at the piano, imprint one's individuality in all its phases upon the interpretation of any given musical composition, have the music so produced cut, and then to use it on a piano player and hear oneself play, certainly seems the fulfilment of the composer's wildest dream.

But that is not all. The recorder relieves the composer of the manual drudgery of putting his thoughts down on paper with pen or pencil. Also, it enables him to preserve the continuity of his thoughts, which is difficult when he is forced to stop to jot down his composition.

An Up-to-Date I

"We have called the Rev.
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"You don't mean it! I ne
What church has he ever had
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"Famous preacher! Sho
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Flags Displa

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"Then the wedding
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"No; the groom's m
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bad form."—*Louisville*

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An Up-to-Date Parson

"We have called the Rev. Dr. Blank to our church next year."

"You don't mean it! I never heard of him. What church has he ever had? Is he a famous preacher?"

"Famous preacher! Should say he was. He has been indicted by a grand jury twice, and was three times suspended from the ministry in four years. I expect we shall have to build an addition to our church in six months."—*Puck.*

Flags Displayed

Mr. Moriarity, who kept a saloon, met Mr. Driscoll, who was a railway conductor.

Says Mr. Moriarity: "What does it mean when you have a green flag flying at the tail end of your train, Mr. Driscoll?"

"It means that another one is coming," was the answer.

The next day Mr. Moriarity was seen pushing a baby perambulator up the street, with a green flag flying behind.—*The Philistine.*

To Be Sure

Customer—"Waiter, this egg is not what it should be."

Waiter (absent-mindedly)—"New York is full of temptations, sir."—*Satire.*

Looked Bad

"Then the wedding was not altogether a success?"

"No; the groom's mother cried louder than the bride's mother. It was considered very bad form."—*Louisville Courier-Journal.*

What Were His Politics?

"Prisoner at the bar, I find you have been sentenced to prison twice before. What have you to say why I should not send you there again?"

"I urge, your honor, the generally accepted feeling against a third term."—*Baltimore American.*

Knew His Place

A revival meeting was in progress and Sister Jones was called upon for testimony. Being meek and humble, she said: "I do not feel as though I should stand here and give testimony. I have been a transgressor for a good many years and have only recently seen the light. I believe that my place is in a dark corner behind the door."

Brother Smith was next called upon for his testimony and, following the example set by Sister Jones, said: "I, too, have been a sinner for more than forty years, and I do not think it would be fitting for me to stand before this assembly as a model. I think my place is behind the door, in a dark corner with Sister Jones."—*Cleveland Leader.*

A Changed Girl

I thought you loved a light-haired girl last year."

"I did, but she dyed."—*Chicago Tribune.*

The Real and the Ideal

The man not long married was looking quite dejected.

"What's the matter with you?" inquired one long married.

"Well, my wife doesn't resemble my ideal at all."

"Um—er," hesitated the old one, rubbing his chin thoughtfully—"does your ideal live anywhere in your neighborhood?"—*Lippincott's.*

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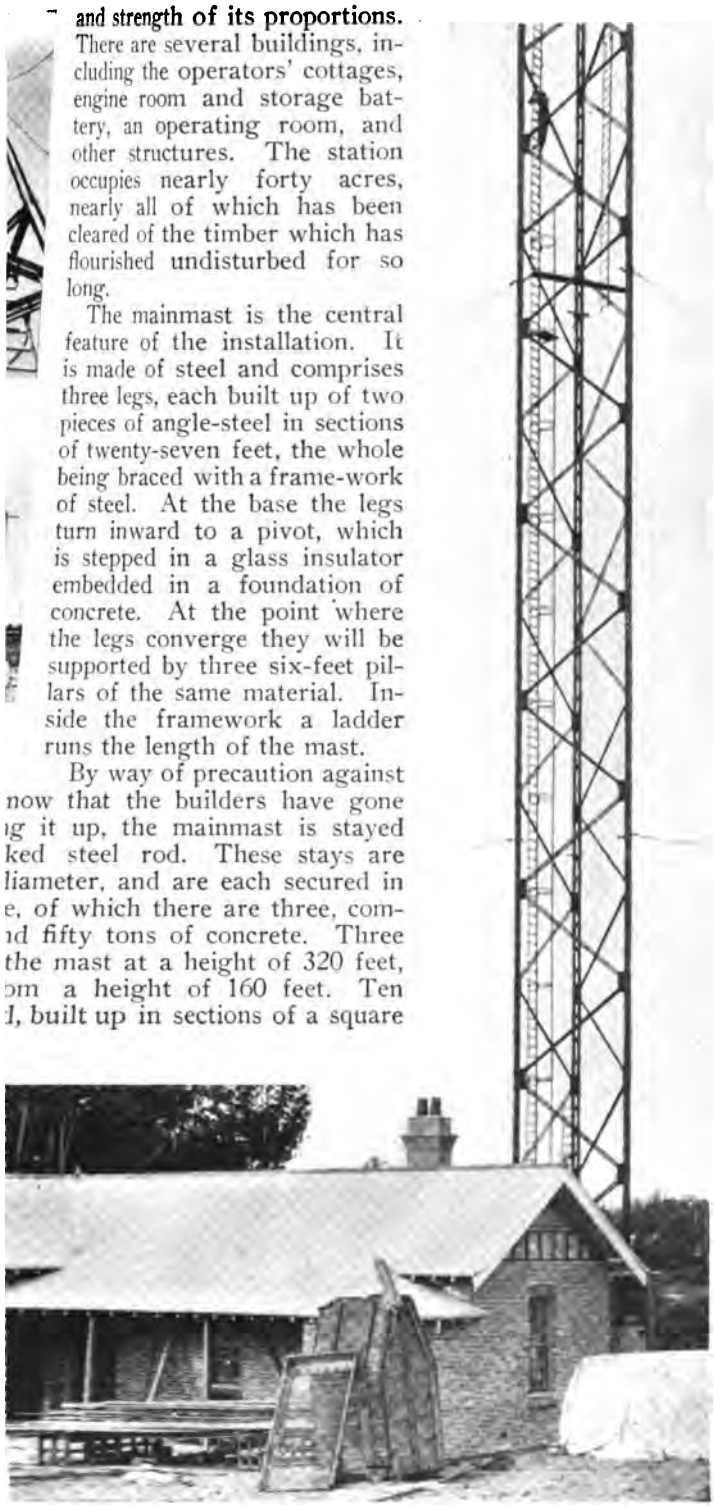
and strength of its proportions. There are several buildings, including the operators' cottages, engine room and storage battery, an operating room, and other structures. The station occupies nearly forty acres, nearly all of which has been cleared of the timber which has flourished undisturbed for so long.

The mainmast is the central feature of the installation. It is made of steel and comprises three legs, each built up of two pieces of angle-steel in sections of twenty-seven feet, the whole being braced with a frame-work of steel. At the base the legs turn inward to a pivot, which is stepped in a glass insulator embedded in a foundation of concrete. At the point where the legs converge they will be supported by three six-feet pillars of the same material. Inside the framework a ladder runs the length of the mast.

By way of precaution against now that the builders have gone ıg it up, the mainmast is stayed ked steel rod. These stays are liameter, and are each secured in e, of which there are three, comıd fifty tons of concrete. Three the mast at a height of 320 feet, ɔm a height of 160 feet. Ten l, built up in sections of a square



RELESS STATION NEAR SYDNEY, AUSTRALIA.

The Rio Blanca i

WONDERFUL M
GRO

THE Orizaba grou
thirty different b
the edge of a tropical f

A PORTION OF THE ORIZABA BIRD GROUP.
shown pouring its waters down through the tropical forests of Vera Cruz.

:XICAN BIRD
]P

›, depicting some ·ds assembled on ›rest and ravine in Mexico, is on exhibition at the Museum of Natural History, New York. From the real foreground made of actual accessories brought back from the forest surroundings, stretch miles of similar forest far below the observer and beyond to

PRESE

THE

WHEN
Mexi
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worth takin
upon hundre
potteries, ivo
naments.

At interval
discovered re
drawn work

A NEW AMERI
It is designed for farmin
was built a

E SONGS OF CHILDREN AT PLAY BY MEANS OF THE PHONOGRAPH IN GERMANY.

OF LOOTERS

nsurrectos at Juarez, : the town" they made ndows, doors, show g else that appeared r success. From all hey took everything broke up hundreds lollars worth of fine 'enirs and onyx or-

ıe side streets, were : of exquisite laces, ɛen hosiery. Bolts

RECORDING THE CRY, FOR SCIENTIFIC PURPOSES, OF AN ASPARAGUS VENDER.

ɣTOR TRACTOR.
ɔering, draying, etc. It
sburg, Pa.

AFTER THE LOOTERS HAD SATISFIED THEIR WANTS.

FAMOUS
MONDS O
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AVERY i
compariso
sizes of famous
of the world is
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gives an unusu
tunity to com
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stones, some c
names are know
ever language i
and news and
read. By num
stones are as foll
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cutting; 2, Loter
gleterre; 3, Grea
of Russia; 4,
194¾ carats, cut
form; 5, Kohino
first cutting; 6, R
rican mines, bougl
valued at $2,500,0

A PUZZLING REFLECTION.
Without a close examination it is difficult to tell which is the top of this picture. The reflected picture of the lady is almost as distinct as the original object.

8, Etoile de Sud, found by a negress in the river Bogageux, sold for $450,000; 9, Etoile Polaire, forty carats; 10, Tiffany yellow diamond; 11, Blue Diamond d'Angleterre; 12, Sancy, for which $70,000 was paid; 13, Emperatrice Eugenie; 14, Scheik of Russia; 15, Massuk; 16, Pacha d'Egypt; 17, The Great Premier Diamond; 18, Tiffany diamond. The styles of cutting are worthy of study. Greatest care was taken by the experts, of course, when these stones were found, to get from each its finest shape and brilliancy. Hence the choice of the differing forms and methods of cutting. The two uncut stones in the photograph will give one a good idea of the problem that confronts the cutter of precious gems.

S DIAMONDS—ANY ONE WORTH A KING'S RANSOM.

HUMANE MET
SLAUGHTERINC

THE Behr pistol, whi
is now being largely
as a means of slaught
an up-to-date and huma
instrument is a simple o
tern is used for dogs, c
pigs, and a heavier pa
cattle. The pistol is in
pole axe worked by arti
of its good features is
lutely safe to use. Ar
bullet enters the anim

HOW THE WEAPON

important thing of all,
point of view, is that th
pain at all, death being
taneous. A cartridge
which returns to the ba
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death takes place on th

NEW PERPETUA
CLOCI

THE dream of ages i
petual motion has l
there is no secret abou
natural laws have to be
and convincing, as mo
ies, it lies before our ey
a reality. The discover
chanician, Mr. F. Ba

ETHODS OF NG ANIMALS

/hich is shown here, ely used in England ghtering animals in mane manner. The e one. A small pat-, calves, sheep and pattern is used for in the nature of a rtificial means. One is, that it is abso- Another is that no mal, and the most

N IS USED.

from the humane ıe animal feels no absolutely instan- forces the bolt, ırrel as the result ssed air. The bolt ike rapidity, and e instant.

L MOTION

s realized! Per- een found. And it—none of our revised! Simple great discover- s; it has become r is a Swiss me- gerter, and it

THE NEW PISTOL FOR THE HUMANE SLAUGHTERING OF ANIMALS.

seems to be natural that the first application of the invention is made to a clock. This clock will run without stopping, without rewinding, as long as its mechanism lasts. The inventor states clearly the principles of his mechanism so that we are able to pass our opinion on it.

It is a well-known physical law that all bodies contract or expand with changes of temperature, some more, some less. The force which is set free by this change of the bodies is a tremendous one and our engineers have to take it into consideration in all their constructional work. So far it has been considered as a very undesirable property of bodies and very ingenious means are employed to guard against this force. Everybody knows how changes in temperature affect a watch, that it will not keep correct time if certain compensators are not provided. Never before, however, has this force been utilized in such an ingenious manner as in connection with the Perpetual Motion Clock.

Long strips of zinc coils are arranged in such a way that the force of contraction is transmitted by means of levers to a winding device, storing up the energy wanted for keeping the clock running. One thousand feet of coil will expand one inch at a temperature change of five

A PERPETUAL MOTION CLOCK.

AN AUTO JACK T

AUTO JAC
OFF TH

THIS auto jack,
by one man, w
the ground in a fe
consists of two
frames, one for ea
side having an adju
of which elevation i
operation of the j
axle support towar
and as it is at first
65 degrees to the g
of the thrust bar ha
the axle from the
frame is held to t
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is obvious that the
taneously elevated.

COLD BF

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ting the little fellow
These brooders are
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pendence being place
generated from the b
A simple form of

AT WILL LIFT A CAR CLEAR OF THE GROUND IN A FEW SECONDS.

LIFTS CAR GROUND

hich can be operated
lift a car right off
seconds. The jack
ectangular tubular
axle, each vertical
able pillar by means
artly secured. The
screw pushes the
the rear of the car
aced at an angle of
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he effect of raising
round. The rear
front frame by a
oves backwards it
ear axle is simul-

ODERS

ultry raisers—that
incubator chicks
that some meas-
attained by put-
in cold brooders.
constructed that
give attention to
regulators, de-
alone on the heat
ies of the chicks.
l brooder may be

made by any boy with a hammer, a sharp knife and some tacks, by utilizing an ordinary cheese box. Of course, first get your cheese box, and once you have it, knock it apart—that is, knock the bottom out and take the lid to pieces, but don't break the rim. Take the rim off the lid and put it together again, but make it a little smaller so that it will fit inside of the wide rim of the box instead of outside as heretofore. With a knife or saw make a semi-circular hole in the rim of the box so as to permit the entrance of the chicks; then the brooder itself is complete. To the hoop that has been made from the top of the box tack loosely a piece of canton flannel or other similar material. Now put the covered hoop into the top of the box or rather in the rim and the job is finished. When the chicks are first placed in the brooder

COLD BROODER FOR YOUNG CHICKS MADE OF A CHEESE BOX.

A

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THE infants'
the co-opera
ties, in the ope
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adelphia, one o
parks in any city
has a large expa
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generally a breeze

On fine days the
kept on the lawns
hospital building.
placed in swinging
shown in the photog
with an attendant to
or six cots they get
chance for life that i
ly better than that th
have in the built-up c
from which they were

The cots are light
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WITH NATURE—ENJOYING HER AIR AND SUNLIGHT.

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ailing infant from above and all around. As the little bunks are suspended so that they swing with the breeze the baby is rocked automatically. When not in use the little bunks can be folded up and carried on the arm. It takes only a few seconds to arrange one of these cots, and so they can be carried from place to place as the sun gets round and the babies are therefore always in a shady spot.

MARYLAND CASUALTY COMPANY'S NEW BUILDING IN BALTIMORE.
It is 328 feet high and but forty-one feet square.

In the crowded quarters of the poorer city residents the babies get little chance to inhale pure air, and they die in great numbers for want of this simple remedy.

When the superintendent of this hospital is notified that a case needs prompt attention the ambulance is sent for the child and it is added to the three score or more of infants always to be found there.

THE *Selandia*, THE FIRST MO
It represents the highest dev
power yet reached for an

TO BAFFLE A

ONE of the engineeri
be overcome in the
irrigation canals is the
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such as constructing a
waterfalls or terraces, e
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Federal Reclamation Se
projects where it was d
of the big canals and ca
a lower level, by embed
solid concrete. The di
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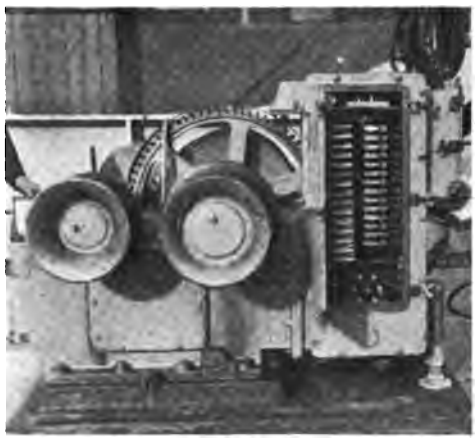
over a hundred yards w

FRENCH GASOLINE
It is a six-horse-power machine an
a mowing machine and for othe

FIRST MOTOR OCEAN LINER.
ighest development of motor
:hed for an ocean vessel.



THE ELECTRIC WINCH OF THE *Selandia*.

FLE A FLOOD

ngineering difficulties to
e in the construction of
is the erosion of the
ne grade or fall of the
t as to cause the water
The prevention of ero-
lished in various ways
cting a series of small
races, etc. A novel and
tive plan was tried and
of the engineers of the
tion Service in one of its
t was desired to tap one
and carry the water to
embedding boulders in
The ditch was built of
a distance of something
yards where it was seen

ROCKS PLANTED IN A DITCH TO PREVENT EROSION BY SUDDEN FLOW OF WATER.

WHEN THE DITCH IS FLOODED.

GASOLINE TRACTOR.
nachine and is utilized for hauling
id for other similar farm service.

that the flow of the water would be very swift, large rocks, as big as a man's body—several hundred of them—were

TESTER FOR AEROPL WIRES

THE wires which hold tog parts and act as braces planes are necessarily under sti In order to endure the strains them, they must be of steel. exists that a number of aeropla lost their lives through the b one or more wires upon their the fact is due largely to the tension to which the steel str been stretched. There has bee rate method of testing the ten the present time, but now a has devised an ingenious and vention which gives the desi with precision and which is s self in use. He has constru paratus based on the well- governing the transverse vib stretched string. It consists enclosing a resonance box. O are attached two bridges, one fixed while the other is mo the bar, thus making the tween the bridges adjustable to be examined is stron against the two bridges by springs. The section of w the bridges is then struck li pencil and the movable brid is adjusted until the sou agrees with a standard tone

WOMAN DETECTIVE RINGING UP MEANS OF POCKET

)R AEROPLANE /IRES

ich hold together the t as braces for aero- ırily under stiff tension. re the strains put upon be of steel. No doubt)er of aeroplanists have ırough the breaking of s upon their planes and ırgely to the degree of the steel strands have There has been no accu- sting the tension, up to but now a Frenchman ıgenious and useful in- ves the desired records d which is simplicity it- has constructed an ap- ı the well-known law ınsverse vibration of a It consists of two bars, ınce box. On these bars)ridges, one of which is)ther is movable along ıking the distance be- adjustable. The wire is strongly pressed bridges by two spiral ction of wire between n struck lightly with a vable bridge beneath it the sound produced ıdard tone upon a tun- ing-fork. The application of the formula which gives the tension of the wire in terms of its vibration is simplified by letting the bridge move over a graduated scale, from which the record is read off conveniently.

TESTER FOR AEROPLANE WIRES.

INGING UP HEADQUARTERS BY POCKET PHONE.

PHONE CARRIED IN THE POCKET

THE Berlin police have a new device that promises a revolution in telephone arrangements, when it shall come into general use. The pocket-phone as now used enables members of the force to communicate with headquarters at any time and from almost any point in the streets of the city, with a readiness impossible to the older forms of police telephones. Each officer — including the woman detectives, one of whom is shown in the photograph—carries a tiny instrument, practically a microphone, which he can take from his pocket and hang upon any one of the many weather-tight and fool-proof terminals, which are placed in convenient localities, and communicate readily with headquarters. The instrument is practical and works efficiently, and there is no reason why it should not be adapted to many uses. Its exceeding simplicity commends it, certainly, for it is vastly different from the huge, unsightly

WHAT HAPPENS
DON'T "SW

EGGS of flies laid
piece of meat left in
sun but a short time
a few hours a host
typhoid breeders
will emerge.

ATER ENEMY THAN THIS. THE COMMON FLY—"SWAT HIM."

BATH

BATH tub
cold wa
cleaners have
of the mules
coal and iron
of concrete a
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deep, six feet
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with cleats, at
to enter and

CURIOUS AUTO

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feet long and a f
This is made of
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standing in the tub.
water in the basin i
a steam jet. The n

STRANGE MONUME
The rails are inte

FOR MULES

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nstalled for the benefit
: of the colleries of a
pany. The tubs are
'e built in the stable
iimals can be easily
They are four feet
and thirty-seven feet
d planes, furnished
:r end for the mules
out. Directly over

FROZEN ALASKA.

and fastened to the
which act as a sup-
shower which is six
t and a half wide.
erforated pipe and
ath to the animals
In cold weather the
heated by means of
iles enjoy this bath

MULE ON RETURN TO SURFACE, AFTER BEING DOWN IN COAL MINE, TAKING A BATH.

so much that it is necessary to keep the entrance chained so as to keep them out when not wanted.

Another cleansing device is the vacuum massage which operates by electric power. The suction curry comb, as it might be termed, is passed lightly over the animal's coat, removing dust and loose hair much more thoroughly than a hostler would do it by hand in the same time.

AN AUTO FOR FROZEN ALASKA

PROBABLY the first automobile to make its appearance in Alaska is shown in the illustration. It was built by a Seattle firm for Mr. Charles Dank-

ENTS NEAR THE TOMBS OF CHINESE EMPERORS AT NANKIN.
tended to protect the stone animals from destruction by curious vandals.

THIS MAI

MENACE

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New Jersey.

The crops o
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E AREA OF SWAMP AND OVERFLOW LANDS OF EACH STATE.

LIC HEALTH

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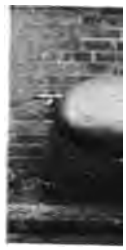
TRICYCLE FOR STREET CLEANING.

It is the invention of Jacquelin, the French champion bicycle rider. At the rear of the tricycle is a revolving brush that sweeps the dust into a basket fastened between the rear wheels.



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TH WHICH THE NAVAL AUTHORITIES HAVE RECENTLY BEEN MAKING NEW TESTS.

-dealing projectile before firing. The little rod on the forward end is the means by when the torpedo strikes the target. The lower photo shows the torpedo after the left, from the torpedo, is the gun from which the shell was fired. The fragments t of the torpedo after the explosion.

NEWSPAPER

China to count years as it is in palace at Peking. It has been a dangerous business editing this sheet. Western editors at the worst may expect only a beating, or possibly an assault with a more deadly weapon, but they always have the protection of the law. The "Tching-Pao" editors, however, on divers occasions in the past ten centuries, incurred the wrath of the ruler, and paid with their lives for it. This specimen herewith shown is the latest form of the paper, which, in its Methuselah-like career has undergone many transformations. It is numbered the 1008th year, fifteenth day, seventh moon of the reign of an emperor of many generations ago, he theoretically being still alive.

THIS NEWSPAPER STARTED BUSINESS A THOUSAND YEARS AGO.

THE V

A STREAK motorist effective idea lands, Califor of paint runs streets in tha very dangerou compound ca impulse of a shorten his cou shoot." This t the wrong-side collisions have tice, so Mr. H plan of running drivers to keep thoroughfare. that could be de serve as a silent and accidents o creased in conseq

MOTOR
CLE

NEW YORK C out two stree employing the ordi principle with the ing belt upon whic thrown and carried machine.

The cleaner shov is the larger of the t tons, when empty. truck chassis with a also carries a water ity for flushing the s

Two men are req the sweeper, one in drive and steer, the rear operating the re volving broom, whicl may be raised or low ered to contact with the pavement at the will of the operator.

An advantage claimed by the manufacturers is that the machine will clean one thou-

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BY FOLLOWING THIS WHITE STREAK AUTOISTS AVOID COLLISONS.

STREET
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the illustration
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THE MOTOR STREET CLEANER AS USED IN NEW YORK CITY.

sand square yards of pavement with forty gallons of water as against four hundred to six hundred gallons used in other machines.

The fact that the wet sweepings are carried into the machine instead of being washed into the sewers is another advantage readily appreciated by the officials of city street cleaning departments.

The builders do not intend to sell the machines, but take contracts to clean city streets at so much per thousand square yards.

The latest appliances for securing efficiency are bound—more oftener, in this wide-awake age, sooner than later—to be applied to all the various business departments, municipal as well as private. In adopting this new motor street cleaner, New York is merely living up to its street-cleaning standards, which are among the highest to be found in this country.

LOWE

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)AT INTO AKE

on Crater Lake, ı like lowering it r Crater Lake is f fresh water in ', or about half an ancient vol- old crater, pre- the banks of the the twenty miles ake is it less than m the rim of the face of the water; ; from two thou- dred feet straight int can the water s by a steep and ıe precipitous in- the shores rise in peaks which tower ıousand feet above are a part of the ade Range, on the mystic lake is sit-

Thus the problem and difficulty of getting a boat down upon the waters of Crater Lake can easily be imagined. The feat has been accomplished only a very few times, first by private parties who wanted to enjoy the unique experience of rowing the first boat on the lake; and later by Government employes, the lake and its surrounding wonderland, two hundred and fifty square miles in area, having been set aside as a national park. The first boat was lowered into Crater Lake eight years ago. It was lost during the storms of the following winter, and another was lowered the next summer. This one remained only a few months, and when it sank, the lake was without a craft of any kind till the Government placed light skiffs for the accommodation of tourists. The lowering of all these presented the same trying difficulties.

In the first place, the boat must be carried by wagon a distance of eighty-five miles. The road leads from Medford, in the southern end of Oregon, up the Rogue River, which river has its source at Crater Lake. It might be stat-

LOOKING DOWN UPON BEAUTIFUL CRATER LAKE.

MODEL OF
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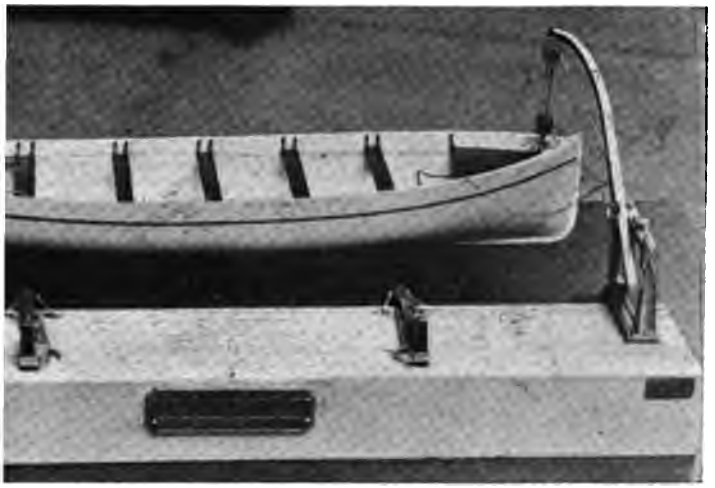

NG HOW LIFE BOATS CAN BE EASILY HANDLED. DEMONSTRATED EXHIBITION IN THE ENGINEERS' SOCIETIES BUILDING, N. Y.

MUSEUM T

ıe and marvelous ɔbably ever to be

fore. After descending the shaft several hundred feet and journeying through a network of tunnels, Dr. Hovey finally emerged into a clear chamber fully thirty feet high and forty feet across.

The chief feature of the chamber was the great greenish-white stalagmite rising at its upper end and reaching almost to the ceiling. So impressive in size and setting, so beautiful in outline, ornamentation and surroundings was this wonderful object that it seemed very little short of vandalism to destroy or mar it, or any part of the cave which it adorned, although in the interests of science or the necessities of mine operation. This stalagmite is about fourteen feet high above the shelf of limestone on which it stands, and its diameter at the

STO, UNDERWOOD & UNDERWOOD, N. Y.

IODEL OF A NEW LIFE RAIT WHICH, WHEN THROWN INTO THE WATER, WILL FLOAT AND HOLD SEVERAL PEOPLE. SHOWN AT THE ENGINEERS' SOCIETY BUILDING.

BROBD

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G WITH GIGANTIC
ASSE SHOT.

"NEVER TOO LATE TO MEND." REPAIRING A BADLY DAMAGED TREE.

lived only in prehistoric ages, if indeed, he ever existed.

FAR GONE, BUT CURABLE

THE photograph above illustrates the extent to which a tree may become diseased without destroying the life of the plant.

Practically all of the inside of the tree has been eaten out by boring insects and fungi. But, though a bad case, it is far from being beyond cure. Two tree doctors are at work upon it; and one of them, it will be noticed, is looking directly through the tree from the back. Presently, after all the diseased wood has been dug out, the hollow places will be filled up with cement, and the tree will be almost as good as new. At any rate, it will have a new tenure of life.

As is well known, the life of a tree resides in the inner layers of the bark, the wood being practically so much dead substance. Whence the practicability of this sort of surgical treatment even for a tree that one would ordinarily think to be in desperate plight

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NEW DEVICE FOR STARTING AN AUTOMOBILE'S ENGINE.

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NEW BABY FEEDING BOTTLE

ONE of the latest applications of heat insulation for domestic purposes is that of an improved case for a baby feeding bottle.

A large percentage of babies are bottle-fed. Milk should be at the same temperature as the human body, that is 98 degrees Fahrenheit. This temperature is always constant. Bottle-fed babies should receive milk at the same temperature if they are to thrive and be free from ailments. When given a bottle of milk at this proper temperature, several minutes may elapse before the milk is all consumed. In the meanwhile the milk has become colder since the temperature of the a room is ordinarily not more than 70 degrees and the last milk drawn from the bottle may be disagreeably cold or the baby refuses to take the cooled food. The statement is made that 85 per cent of infant mortality is among babies that are bottle-fed. Of course it must be borne in mind that this is due not to cold food alone but also to the kind of food which is used, this being a big factor.

IMPROVED FEED BOTTLE FOR INFANTS THAT MAINTAINS TEMPERATURE OF MILK FOR A LONG TIME.

The newly improvised feeding case consists of a double walled case which holds the glass feeding bottle. The two walls of this case are about one-eighth inch apart and this space between the walls is filled with felt, which is a good heat insulator. The case is also brightly nickeled to prevent radiation. The bottom is slightly raised and so constructed that the

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ing strain comes there. Directly beneath the boiler a simple cylinder is placed. Steam is piped to this cylinder from the top of the boiler. By moving the lever at the engineer's side on platform steam is admitted to the cylinder to either raise or lower scarifier. When raised, the spikes clear the ground sufficiently so that they do not interfere with any other

A MODERN GARBAGE TRUCK.

The street cleaning department of Paris has put in commission a garbage truck, in the form of an automobile. It is covered by a rolling top, so that the odor and dust of the contents are well confined.

operation of the roller. When lowered, they are forced into the ground and are held there by steam pressure. It takes but a fraction of a minute to raise or lower them.

In tearing up a street, the surface may be torn right up to a crossing, then the spikes are raised, carried over the walk, and dropped on the other side without stopping the roller.

It is claimed that this attachment has demonstrated that it will do the work much better and cheaper than can be done by any detached machine. After the surface is broken up, the old material is put in shape by the grader, and the job completed by rolling; giving practically a new road at much less cost than an actual new one.

AUTOMATIC STUCCO MACHINE

AN inventor living at Port Chester, N. Y., has recently produced a stucco-making machine that not only duplicates the results produced by hand work, but

DR. ALFRED GRADENWITZ.

THE MEN WHO MAKE THE MAGAZIN

DR. ALFRED GRAD
WITZ, the Berlin cc
spondent of the TECHN
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C. H. CLAUDY is distinctively a lover of nature, of the out-of-doors. Whatever he takes an intense interest in, he writes about. His work is not of the reportorial style. He does not try to "dig up" something concerning which a certain number of pages may be filled. His pursuits are too absorbing, his interests too wide, to render that necessary.

The camera is his constant companion. He takes more delight in getting a successful snapshot than does a sportsman in bringing down a bird under adverse conditions. His home is in the city of Washington.

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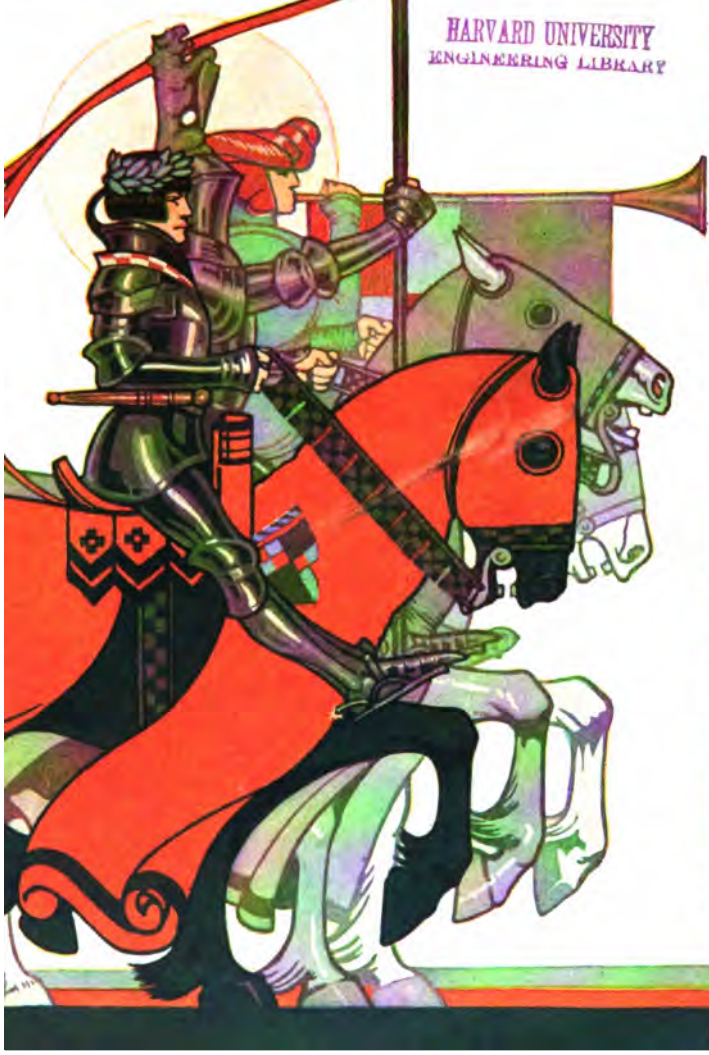

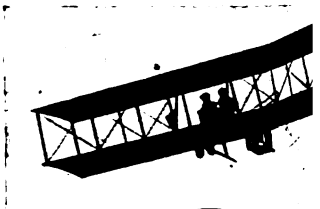

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Technical World Magazine

HENRY M. HYDE, Editor

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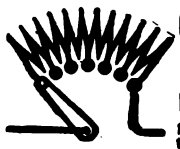
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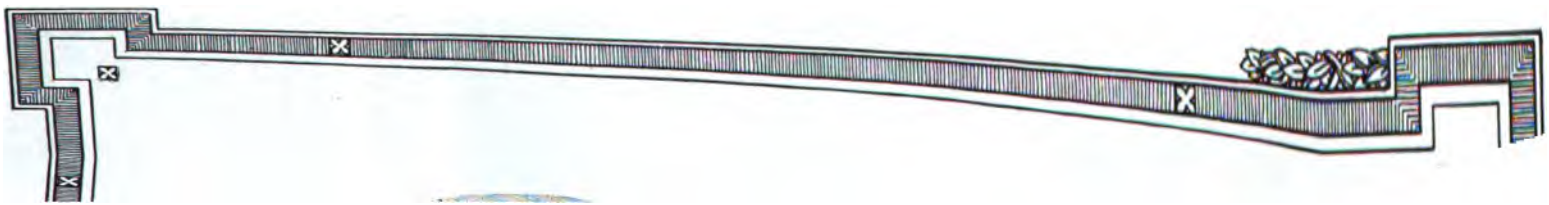

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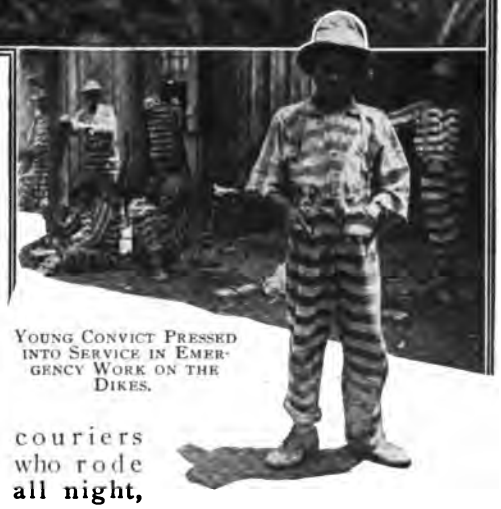

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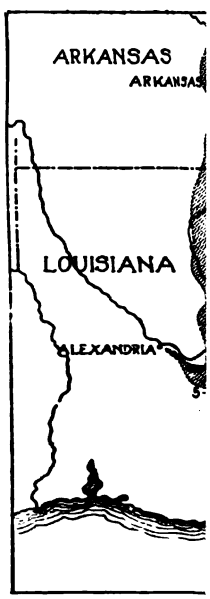

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of hills, the Mississippi River levees and the levees of the Red, converging at the peculiar bit of country where the Mississippi, the Red, the Old River and the Atchafalaya are united. This is the critical location, and levee engineers made a hard fight, but lost, and the great levee at Torras gave way, by far the most disastrous crevasse of the present flood. Meanwhile, the levee at Beulah, Miss., on the east—left—bank broke, flooding the upper Delta, which includes Sharkey, Issaquena, Bolivar and Washington counties.

Water from the Torras break spread over a vast area, and the break itself widened to a gateway for the roaring waters more than half a mile wide. Still the gauges below climbed, and at last, the levee at Hymelia plantation, about forty miles above New Orleans, but on the opposite, the right bank, gave way.

There were minor breaks. At Angola, La., the state penitentiary farm was flooded. Bayou Sara, La., was inundated, and a small break near the Gulf did a little damage. A populous trucking and cane region in Avoyelles parish was flooded by a break in the levees protecting Bayou des Glaizes. Three crevasses in the Atchafalaya River levee system, above and below Melville, La., inundated that town, and a large surrounding area, much of which was swamp. This prac-

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:t is a good average height,
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to seepage; does not cave away, or suffer much from wave wash—but "buckshot" is not to be found everywhere.

One rule is invariable. Rock must not be used. Not a stone or a stick goes into a levee. These tend to make a levee porous, and a vertical filter is the last thing desired. Packed earth is the best, and for this reason, an old levee is better than a new. The earth packs and dries harder and harder with each succeeding summer, and grows a thick matting of sod, than which there is no better protection from wave wash. Every effort is made to grow grass on the levees.

Where a wide batture can be found, the situation is even more safe. The batture is the flat table of land which stretches out to the channel of the river, a flat stretch between the toe of the levee and the stream in low water. A batture is a silt deposit, but so old, often, that good-sized oaks and thick screens of willows grow upon it. The reason for the factor of safety a batture offers is almost self-evident. The current over the batture seldom is as swift as in mid-channel,

A Topped Levee at Baton Rouge.

Doing Business in a Flooded Store at Hickman, Ky.

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CONVICTS AT WORK ON A LEVEE NEAR MORGANZA, LA.

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ıe water will seep, and up from beneath as well. Ditches are the remedy for this. Some seepage seems inevitable. Unless it becomes so heavy that it collects behind the levee and threatens to soften it, it does not mean much. If the seepage becomes serious, "blanketing" is resorted to. The "blanket" is of dirt, spread over the face of the levee, plastering it thick with mud which works its way into the crevices which are leaking.

Day and night the levees are guarded, when the river threatens thus, militiamen and volunteers do turn about with Winchesters and shotguns, watching for any sign of trouble. There is another reason for the guards. A break on one side of the river relieves the danger for miles on the other side above and below. To save his own broad acres, temptation to use a little dynamite across the river might be too strong for some weak brother. So the rifles mean business, and when one visits a levee in flood time, it is with adequate explanation of one's reasons.

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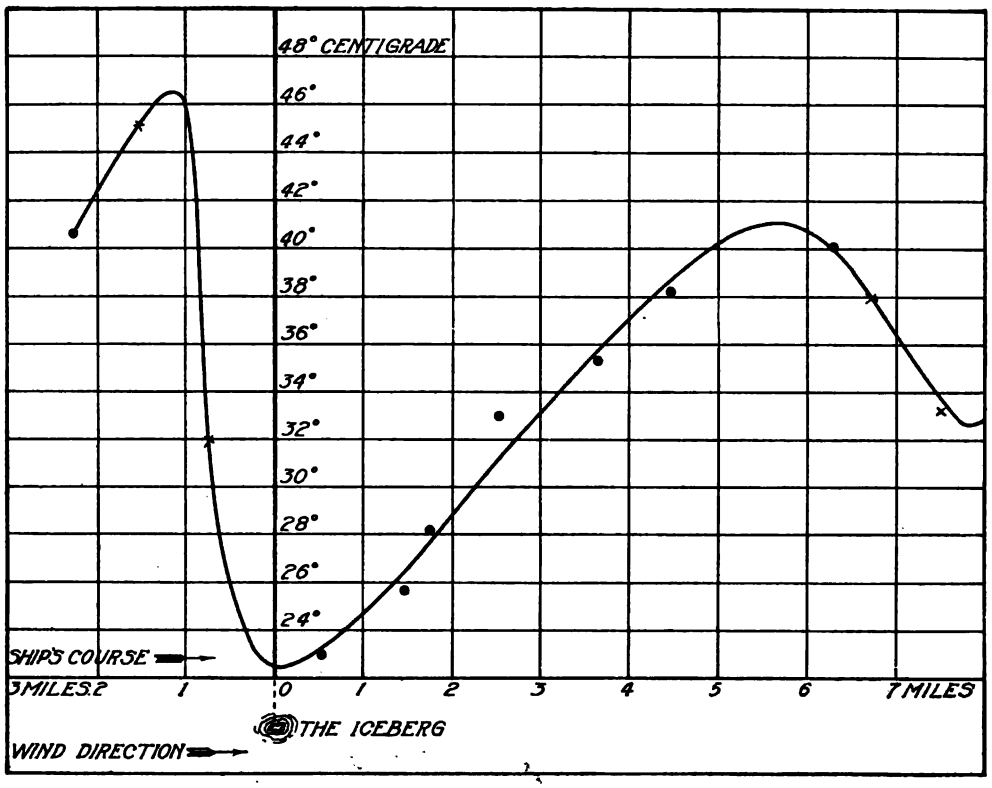

AN ACTUAL RECORD MADE BY PROFESSOR BARNES' MICRO-THERMOMETER ON BOARD SHIP WHEN PASSING AN ICEBERG.

one-thousandth of a degree, and so striking is its record that whereas on an ordinary thermometer a single degree is usually represented by only one-eighth of an inch, the micro-thermometer represents a single degree by an interval of two feet.

"Moreover, the micro-thermometer is designed, not to be dipped into buckets of water at frequent intervals, but to be permanently attached to the ship under the water line, and, by means of wires leading from it to the chart room, to make a continuous record in the chart room of the water temperature. With this thermometer being towed along with the ship, and with a continuously-recording instrument attached to it in the chart room, the presence of an iceberg unerringly makes itself known by the persistence of a gradient of temperature.

"Here is how I would equip a ship. An iceberg, of course, is continuously giving off a current of cold water all around it. This cold water, being fresh water, is lighter than the salt water, and spreads out over the surface of the sea for two miles on the windward side, and seven miles on the leeward side. Now if a micro-thermometer were fitted at the bow, about two feet below the water line, and another micro-thermometer at the stern, as deep down as the draught of the ship would allow, the bow thermometer would catch the cold surface current, while the stern thermometer would remain at the normal sea temperature. In this way whenever the differential record read so that the bow thermometer was colder than the deep stern instrument, this would be taken as an indication of disturbance due to the presence of ice—an unmistakable indication, because it could be due to no other cause. If the recording instrument showed this temperature to persist and become greater, the ship would be approaching the ice; if it decreased the ship would be leaving the ice behind."

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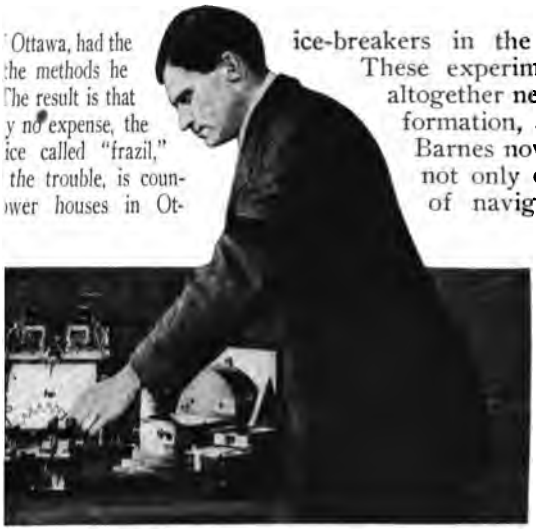

SSOR BARNES ADJUSTING THE ELECTRICAL APPARATUS THAT IS ATTACHED TO THE MICRO-THERMOMETER.

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ice-breakers in the ship channel. These experiments throw an altogether new light on ice-formation, and Professor Barnes now declares that not only can the season of navigation be considerably lengthened, but that a moderate expenditure of money will keep the channel open and the route secure throughout the winter.

"I believe this so firmly," he says, "that I have no hesitation in predicting that Montreal, one thousand miles as it is from the open sea, will be a yearly port just as soon as the commercial interests demand it."

Professor Barnes' scientific work proves to be of a nature applicable to some of the problems of everyday life.

gs of Diogenes Laertius

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Since this process involves the complete destruction of the trees, even the boundless forests of Formosa did not promise a permanent supply, and the canny Japanese decided that they must make the greatest possible profit out of their monopoly in the shortest possible space of time.

From 1902 to 1906 the price was raised so rapidly that camphor gum, which sold at wholesale on the American market for fifty-seven cents in the first mentioned year, brought $1.17 only four years later.

Hemmed in behind the death-dealing wire fence, the little yellow men piled up millions, which went to the purchase of war materials for their coming conflict with the Great Bear of the North.

But the rapidly rising price of camphor and the rapidly increasing demand for it in various processes of manufacture had still other results. In Germany, especially, which owes so much of its commercial prominence to the labors of its scientists, a number of skilled

YOUNG SEEDLING

CAMPHOR TREE.

OR TREE TO PIECES FOR THE PURPOSE OF DISTILLING THE CHIPS.
d is unnecessary. The camphor is now being extracted by Western scientists without killing the tree.

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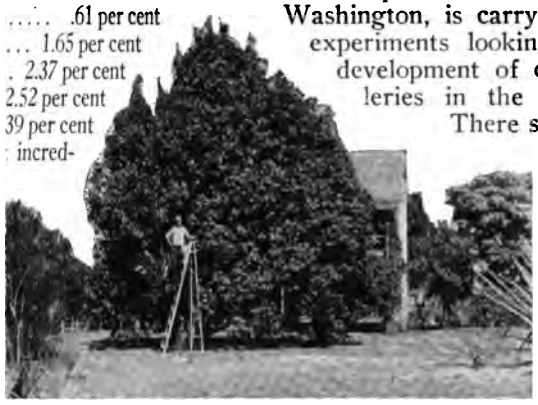

A CAMPHOR TREE IN FLORIDA.

a few careful tests,
have been obtained
lves saved to pro-

At present arrangements are being made for the production of camphor on a large scale on the Island of Jamaica, and the Department of Agriculture, at Washington, is carrying on further experiments looking towards the development of camphor distilleries in the United States. There seems to be no reason why the United States need much longer send abroad the several million dollars which now go largely to the Japanese government for camphor gum and extracts. In an indirect way, perhaps Professor Duncan may prevent the Japs from accumulating another war fund.

ayings from Plutarch

difficult a matter is it to trace and find out of anything by history.

to assert that wise men profited more an fools by wise men; for that wise men e faults of fools, but that fools would not good examples of wise men.

es said that a man's discourse was like ersian carpet, the beautiful figures and which can be shown only by spreading it is contracted and folded up, they are lost.

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BOY SCOUT VEHICLE AS A CAMP WATER CART.

PATIENT IN BOY SCOUT AMBULANCE.

PLAYERS' INVASION OF THE UNITED STATES.
is composed of Chinese. They were able to visit this country through the
:ing of wealthy Chinese merchants of Hawaii.

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ICAL CULTURE CLASSES OF BERLIN, GERMANY.
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A DAINTY TOILET NOVELTY.
This is the new mouchoir bracelet which has been designed for ladies to take the place of the obsolete pocket. It consists of a handsome bracelet, jeweled or otherwise, according to taste, with a tiny clip attached, into which a pretty lace handkerchief may be inserted. The whole makes a charming and at the same time useful ornament.

face of the water. More than half the cost of the entire structure was put into the foundation.

VESTON'S NEW CAUSEWAY.

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The method has been
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ges. Now comes Presi-
his forthcoming book
and a lot of valuable information for the beef industry.

President Waters is an internationally accepted authority in questions pertaining to the science of animal husbandry, but he has done a whole lot more than study that branch of learning. He has made a business of investigating conditions to improve rural life, economic, social and religious, and he is today, the one most frequently mentioned as successor to James Wilson, Secretary of Agriculture. As president of one of the largest agricultural colleges in the world he is, of course, a rather busy person, but he has had time to be, also, president of the Kansas State Teachers' Association, and in this capacity has been instrumental in putting many new ideas into operation in Kansas rural schools. Kansas enacted a law, a year ago, largely through Mr. Water's influence, requiring the teaching of elementary agriculture in the rural grade schools, and of domestic science in the high schools.

President Waters is forty-seven years old. He was born and reared on a stock farm in northeast Missouri, and was prepared for college by his father, a civil engineer for years in the government's service.

If ever he goes to Washington to stay the country will notice a distinct rumbling very shortly afterward. He has a lot of ideas, and can start things.

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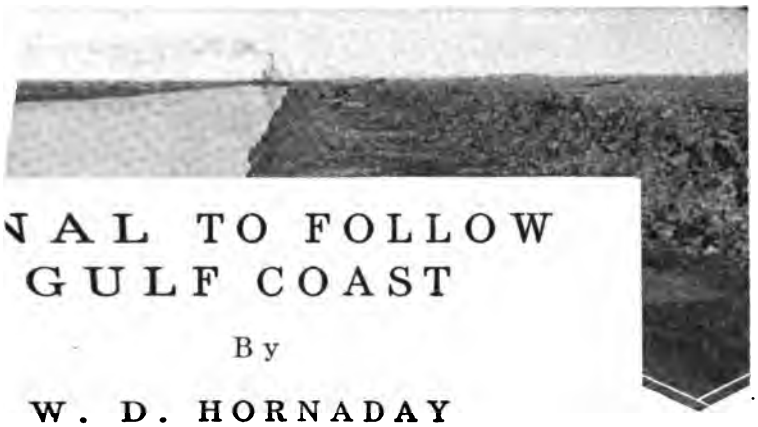

NAL TO FOLLOW GULF COAST

By

W. D. HORNADAY

om the mouth of ande at a point miles east of Texas, to the e Mississippi below ved shore line of forms more than circle.

d waterway that is the shore line and nished, connect the Rio Grande, is now Its length, accord- will be approximately s.

thus far made for the ggregates $1,021,000. stretches of the inter- been finished and are coastwise navigation. at ten million dollars o completely open this it with navigable riv- oughout Louisiana and

n the coast line that or the intercoastal canal le streams in Texas and y give the map of that arance of an open fan as ribs running towards t of these streams are at ess from a navigation g largely to the fact that nnecting deep water out- l will meet this require- place many thousands of ble water in the two States nection with the sixteen s of the Mississippi and its tributaries which are open to navigation. It will be the means of solving the transportation problem for an enormous scope of territory situated adjacent to the Gulf of Mexico. Flowing into that section of the canal running through Louisiana are more than four thousand miles of waterways, of which twelve hundred miles are now navigable. In Texas, the navigable portions of the rivers which the canal will tap aggregate about fifteen hundred miles.

Many stretches of the route of the proposed canal run through shallow lagoons and bays that are practically landlocked by islands. The longest of these barriers that intervene between the Gulf and the canal is Padre Island which runs from a point a few miles north of the mouth of the Rio Grande to Corpus Christi Bay, a distance of more than one hundred miles. Along the Texas coast is a chain of islands that extend northward to the upper end of Matagorda Bay, and through the shallow water between these islands and the coast the links in the canal will be dredged where such work is required. Only a few short links will be needed to connect the lakes and bayous and make one continuous waterway from the Mississippi through that State.

It is estimated that the annual saving of freight to the people immediately in touch with this interstate inland waterway, based on the present commerce of the tributary territory, would amount to more than one million dollars. This, however, is said to be but a small item of the financial benefits that would come directly to the shippers and consumers

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At Work Cutting the Canal through Swamp Lands.

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connecting streams which have all been deepened and improved. It follows the Atchafalaya river to the mouth of the Teche river and continues up the latter stream to a point near the town of Franklin, thence to Cote Blanche and Vermillion, across same connecting with White Lake and Grand Lake through the low marsh land of the coast adjoining and intersecting several small lakes and bayous, and crossing the Vermillion, Mermentau, Calcasieu and Sabine rivers. From a point in Sabine Lake just above the port of Sabine Pass the route of the canal runs across a strip of marshy land to East Galveston Bay, thence through a number of lagoons bordering the Texas mainland and sheltered from the Gulf by islands and cutting through the peninsula between the Brazos and Colorado rivers to Matagorda Bay, through that land-locked body of water, thence across Pass Cavallo, through San Antonio Bay, Corpus Christi Bay to the Laguna Madre, which it follows to a point opposite Point Isabel, just east of Brownsville, and then by dredging a short stretch it enters the Rio Grande near the mouth of the latter stream.

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AMERICA'S OLDEST RAILWAY ENGINEER.
Born in 1825, Michael Miles became a fireman in 1848 and an engineer in 1856. He now lives, with his wife, at Albany, New York.

RMAKERS IN A FACTORY.

READING TO CIGAR-MAKERS

THE cigar-making industry of Cuba within recent years has been transferred to a considerable extent to Florida, and in that State finds its principal center at Tampa. With it has come across the Florida Straits a rather curious custom, which is that of employing a professional reader to entertain and instruct operatives in the factories. Since the work of a cigar maker is purely mechanical the reading does not at all interfere with the speed of the workers.

Such a reader is paid not by the owner of the factory, but by the workers, many of whom never receive any education

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.LL THAT WAS LEFT OF A COTTON FIELD AFTER A CRAWFISH RAID.

; THE CRAWFISH PLAGUE

By

RENÉ BACHE

ıvestigation by the ıt of Agriculture has t the crawfish plague ɔf the South is far ous than was sup- planters, as a means destruction, are pay- ɛ rate of a barrel of for each barrel of

e areas of clay lands Alabama it is almost e crops of any kind heavy "gumbo" soil, saturated with water, l home for crawfish, ı their tunnels even in

of the Department of s that over a wide stretch of country, estimated at not less than one thousand square miles, crawfish prevent to a large extent the successful production of cotton and corn. Cotton is the worst sufferer, whole fields of young plants being sometimes destroyed in a single night. An examination of a cotton field after a raid by crawfish shows that they tear away the tender seed-leaves and carry them to their burrows. How many plants one of the crustaceans will destroy in a night is not known, but it would seem that most of the feeding is done underground and not during the time of gathering.

Some idea of the extent of the infestation in the district referred to may be gained from the statement that in badly infested areas there are from eight thousand to twelve thousand crawfish holes

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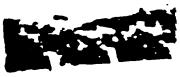


HOLDIN

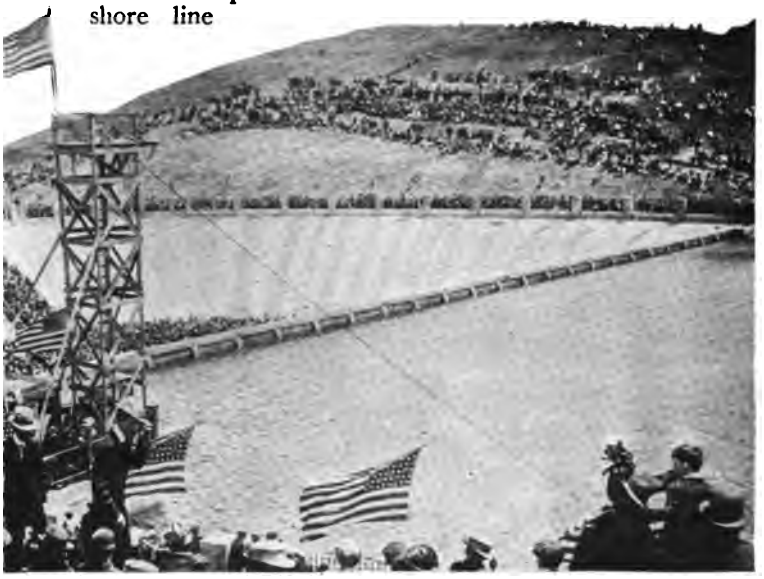
ABOUT WAY OF PUTTING CATTLE ON BOARD SHIP.
they are dragged out to the ship by a boat, and then hoisted on board.

E ON BOARD P

us way in the Ha- f putting cattle on hoto was taken at The coast appears d. As a matter of ore slowly declines : it meets the waves s are unable, in this er to the shore than mile to half a mile. , therefore, to trans- ong-horned cattle of r of the islands, cow- nts, sailors and row- it into service. The from the ship shore line rope the steer and drag and drive him out to where the rowboat awaits them. The steer is then taken in tow and is obliged to swim, often sorely against his will, out to where the ship is anchored. Here he is swung up by means of a rope harness that securely holds him in position while stout arms turn the windlass.

HUGE RESERVOIR FOR FIRE SYSTEM

TWENTY thousand persons gathered recently on Twin Peaks for the dedication of the new Twin Peaks reservoir, an important part of San Francisco's new auxiliary fire protection system, for



TORY SERVICES IN A RESERVOIR, ON TWIN PEAKS, NEAR SAN FRANCISCO.

been recognized, the northern or Nubian giraffe and the southern or Cape giraffe. The former is marked with fine light lines on a chocolate-colored ground while it also possesses three "horns" or stumps upon its head. The southern giraffe is covered with brown blotches on a buff ground and has two horns. The giraffe Hagenbecki is much more definitely marked than these, the patterns being larger. The lines are distinct and the ground specimen is quite young it is expected to eighteen or nineteen

BOARD RID

THE native Hawaiians the world's champion swimmers and expert Surf board riding is one of their favorite amusements. The practice is to so direct the bit of flat, unstable plank as to recede with the waves as they run

THIS M

NATIVE HAWAIIAN RIDING A SURF BOARD.

seaward in a great level flood after breaking their strength upon the sandy beach.

The illustration shows one of the most extraordinary feats of an agile and unusually skillful swimmer. It is no uncommon sight to see one of these men maintaining his balance on the bit of board, with his feet, as it sails by on the receding torrent. But the sight of a man standing on his head and maintaining his equilibrium is one that aroused the photographer's admiration. Fortunately he was able to catch a snapshot of this remarkable piece of clever water craftsmanship.

bolder and much very light and dis- very dark. The ng and full-grown each a height of feet.

G THE SURF

iians are pion 's.

SHOOTING THE CHUTES WITH AN ALLIGATOR

ABOUT the most curious mode of making progress that has been devised is to allow oneself to be pulled down a slippery chute by an alligator. It was one of the "stunts" of a German, who is making a trip around the world to win a

ERED THERE ARE TEN THOUSAND WAYS TO BE UTILIZED TRAVELING AROUND THE WORLD.
This is one of them.

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ROM THE DOCK AT SEATTLE FOR THE TESTING GROUNDS OF THE SUBMARINE TELEPHONE.

ONING UNDER THE OCEAN

By

J. G. DONALDSON

onths ago at Seattle, gton, in the presence cable officers of the ableship *Burnside* and mbly of electrical engi- cists, Alfred Williams s new—and revolution- telephoning or cabling

his case was a bare iron s long, stretching from ainland to the north end and lying in naked con- t waters of the Pacific. wire was sent the sound oice and continuous and ation was kept up for mainland at Seattle.

ndpoint of the onlooker, g incident of the day oc- the close of the demon- graphone was attached to lephone receiver at the island end. On the shore end of the line a phonograph was set in operation. It was towards the close of a demonstration that had mystified the electricians present and the air was full of tension that could almost be felt.

The inventor had been trying to explain to those present the principles that lay behind his instrument. Amid a rapid fire of questions directed towards him by those present, there suddenly floated forth the notes of the "Hero Song" from the "Chocolate Soldier." With a startling distinctness the melody rang throughout the long hall and passed into the crescendo at the end as if some gifted prima donna had sung behind a curtain.

I looked at the man who sat next to me—a distinguished professor of physics from a noted university. On his face was a puzzled expression as of one who had just stepped from a well-known land into a world of unreality and had not

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THE WATER FRONT AT SEATTLE.
Island to Seattle, a distance of eleven miles, a telephone wire beneath the waves conveyed the sound of the human voice for hours.

re then seemed a limitation prevent the use of the system listances. For an ocean cable ong enough to prevent break- dal action or from a number ıses. Mr. Williams overcame by an ingenious method of ıe greater part of his cable. proceeds to send over this current that he calls a "pilot This current has nothing to e talking current and must ounded therewith. He has this current can not have a *ntial* than 1.6 volts, which is ion point of hydrogen. But you think a current so small d have any effect on a wire, hen you consider the well nd recognized ohmic law of Not very far, the physicists concluded and all the lesser in the wake of their con- t that is just where they ake. And by virtue of this l back the progress of the ıade more difficult the free ɔn between the continents. lliams discovered the same Marconi discovered with his s. Once they were thrown ni found they would con- to an indefinite length and n, it was only necessary to ıment of sufficient delicacy, the distance be half across

s discovered, that once the a wire were set vibrating charge, the vibration con- end of the wire although it was so feeble that men had not found it. And he discovered that when a wire was placed in this condition, by a "pilot current," it allowed a second current to slip over the wire, much as a skater passes swiftly over thin ice.

And it is during the time that this pilot current is on the line—and this can be continuous if desired—and during the deposition, neutralization and clearing away of the charged ions and their products, that the talking current is sent in an undamped wave—waxing and waning after the manner of an alternating current. And this talking current reproduces at the receiving end the exact wave length given it at the sending end and in the exact order of its receipt.

The practical results following this invention are many. For instance, it will greatly reduce the present cost of laying cables, even if the Morse system were to continue to be used as the means of conveying the signals. For instance, it will cost the Government some $400,000 to lay the new cable to Alaska.

By the Williams system it would cost $20,000 to lay the same cable. Again, it will enable the present speed of sending cable signals to be greatly increased, if the Morse system is to be adhered to. But above all other things, it will make possible an actual conversation between any of the continents.

And thus is a new trail broken into the unknown by this pioneer. And thus has he made it possible for the continents to be linked together more closely by the telephone and annihilated distance by another remarkable scientific achievement of mankind.

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VING SIDE VIEW OF THE REVOLVING FORM AND CONCRETE MIXER.

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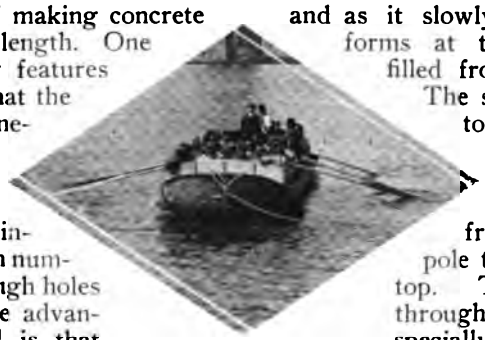
THE FORM AS SEEN FROM ABOVE.
Two concrete blocks in the foreground.



PHOTO, UNDERWOOD & UNDERWOOD

THE LUNDIN DECKED LIFE BOAT.
It has a capacity of sixty persons. It is self-bailing and non-collapsible and has eight water-tight compartments.

conditions require, without the need of taking down old poles and setting up new ones. In transporting poles to places far from the railway for desert telephone lines, power transmission companies, etc., the convenience of carrying sections rather than fifty-foot poles is readily seen.

In operation the revolving form is set horizontally, and as it slowly rotates each of the forms at the circumference is filled from a concrete mixer. The sections are designed to produce a block nine inches high and of diameter varying from eleven inches from the base of the pole to seven inches at the top. The taper is perfect throughout the entire length, specially ground steel forms having been prepared for this purpose.

The invention is an ingenious one that will add to the popularity of concrete.

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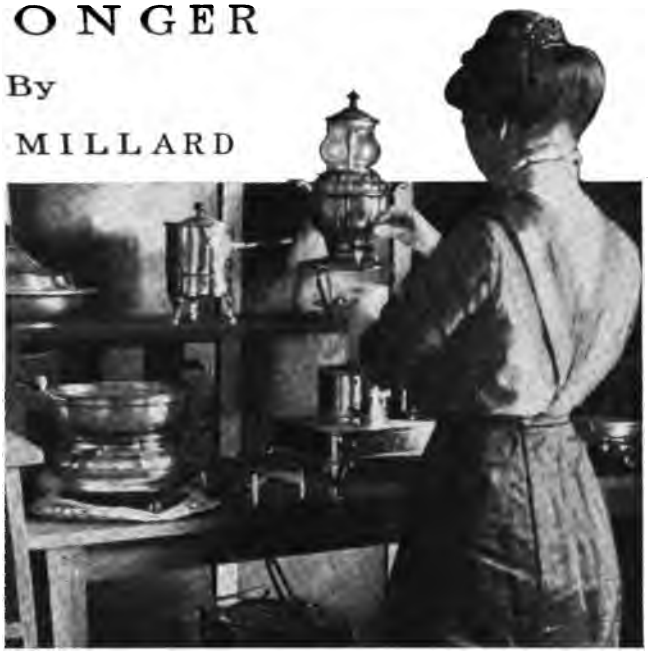
By MILLARD



SH CORNER OF THE SCIENTIFICALLY ORDERED DINING ROOM AT COLONIA, NEW JERSEY.

vith drudgery! That slogan of the scientific eeper of the day. To e science has for years the housewife; but it her care, labor or ex- has lacked has been ervation of energy and y have been attained in ie mill. The hiring of rvants has not added to her to her discomfort. owever, is not how to semaid, for the house- ting herself. She has ory as a far more digni- place of occupation, and remain in the home are pay, far higher than the an afford. So that the how to get along com- hired help.

ainy woman in Colonia, o is doing this. What is more, along with the work required to maintain in spotless condition a house of sixteen rooms, and big ones at that, and the providing of meals for the family, she actually finds spare time in which to teach other women how they may keep house without servants. This woman is Mary Pattison, formerly President of the State Federation of Women's Clubs of New Jersey. What Frederick W. Taylor, the father of industrial efficiency, has done for the factory Mrs. Pattison is doing for the home.

Mrs. Pattison lives in a large country house set upon rising ground. She has few neighbors in the new hamlet of Colonia and plenty of elbow-room, which such energetic women always need. Her broad-eaved, cedar-shingled house is flooded with sunshine from many mullioned windows. On the west is a two-story annex which is entirely devoted to the exhibition and demonstration of hundreds of wonderful labor-saving devices,

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Dining at the I
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ELECTRIC PAPER-BAG COOKING.

TARY KITCHEN.
is the garbage and paper-dish
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ich is a round revolving
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really serviceable kind of
used at all save formal
of china or porcelain, to-
aper napkins, and, if de-
ups and wooden fork and

spoons. When the meal is over dish-washing consists of dropping the dishes into the incinerator. This is simply an upright, airtight steel case, chiefly used for the chemical reduction of garbage. It saves a great many steps to the garbage can which is generally placed at a toilsome distance from the kitchen.

Now we shall go into the neat, sweet-smelling Pattison laundry and there we shall see an amazing array of washers, boilers and wringers worked by electric motors. "All good," says Mrs. Pattison, "but none any better than this simple hand device which, considering that you work it without artificial aid, is a wonder."

She holds up an implement that looks like a plumber's plunger—a small funnel-shaped affair fastened to the end of a three-foot stick. On examination the device is found to be a series of funnels within a funnel, all of which work on the suction principle when the instrument is thrust down upon the wet clothes in the tub. The way this plunger cleanses clothes is marvelous. It is also very cheap and requires but a moderate expenditure of elbow-grease.

The clothes wringers and pressers are

A GENERAL VIE\

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ROBE

TEN million tons of A
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This is no guessw
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to be done is to pump out the
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which it is mixed, and put it up
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Imagine a glistening plain o
salts—a crust at least sixty feet t
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The crust is composed of ordina
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and various other minerals. It
posit on the bottom of an ancie
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Ages ago the lake covered seve
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was seven hundred feet above
crust above described—as shown
marks of an old shore line al
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ENERAL VIEW OF THE PLAYA LAKE COUNTRY.

I DISSOLVED IN BRINE

By

ROBERT FRANKLIN

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represented today by the salt flat—occasionally covered, after a wet season, by water.

This strange Borax Lake, as it is called, in the northwest corner of San Bernardino County, is what is called a "playa," or intermittent lake. But even when there is no water there, as is usually the case, the salt crust, which is very porous, is saturated with a brine that rises to within a few inches of its surface. The brine contains forty-three per cent of solids, and seven per cent of it is potash.

The "pocket" has received the drainage from surrounding hills for many thousands of years, during which vast quantities of mineral salts, dissolved out the rocks, accumulated in it. Eventually the water evaporated, but the salts remain, forming the glistening white plain described.

In trying to cross this plain under a brazen sun, many men have lost their lives. The mirage plays some of its strangest tricks here, and the traveler passing over the lake bed can generally see what appears to be a broad sheet of water only a little way ahead—always a

. The price soon fell,
rles and Skillings were
orax" (F. M.) Smith,
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Englishmen sunk wells
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inquiry was started by
they tried for potash.
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rom their wells streams

UNDER THE CRUST OF BORAX AT SEARLES LAKE THE GOVERNMENT SCIENTISTS HAVE NOW FOUND POTASH.

of brine which proved to contain seven per cent of potassium oxide.

IN THE HEART OF THE REGION OF GREAT MINERAL SALT DEPOSITS, SOUTHERN CALIFORNIA.

The brine-saturated part of the crust covers at least eleven square miles, by far the greater part of this area being in the public domain—though a considerable slice is owned by Smith, and the Englishmen are understood to have located claims. Samples taken by experts of the United States Geological Survey and the Bureau of Soils from six wells scattered over the salt flat show that the percentage of potash is in all places about the same.

As already stated, the quantity of potash "in sight" is at least 10,000,000 tons—only a thirty years' supply for the farmers of the United States. But, pectation that some to be rich potash min indeed, may be far m Borax Lake.

The upshot of th that we have found in this country depos pensable to agricultu which we have hither upon Germany.

A PLAYA, OR INTERMITTENT LAKE, COVERED WITH A CRUST OF MANY FEET IN THICKNESS.

PRISON MADE OF BAMBOO

IT is an old story that "stone walls do not a prison make, nor iron bars a cage." In the Philippine Islands iron bars are not required even to make a cage for human beings.

The structure in the accompanying photograph is easily recognizable as a cage, and is in fact a jail, on the Benguet Road, in Luzon. Petty offenders are confined in it temporarily, while on their way to the police court. However, an armed guard is stationed outside, and his vigilance makes the real security of the prisoners.

JAIL BUILT OF BAMBOO, IN THE ISLAND OF LUZON.

BULBS IN HER BONNET

ELECTRIC bulbs in a lady's hat is the latest device of a Chicago milliner, who has cleverly concealed tiny incandescent lights in artificial fruits and flowers that trim the hat. For wear during the day, the lights are switched off, but at night a tiny battery concealed in the head dress supplies current for the bulbs, making a beautiful and striking effect. While they may never come into general and popular use, they are undeniably original and could be effectively used on the stage in spectacular productions.

INCANDESCENT LIGHTS AS HAT ORNAMENTS.

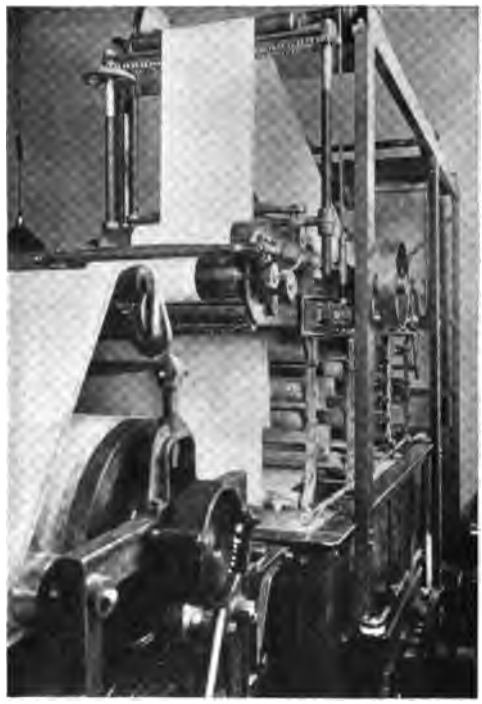
ELECTRIC JACK THAT LIFTS A TWO-HUNDRED TON LOCOMOTIVE.

PICKING ENGINES UP FOR REPAIRS

IT has been the practice to use a traveling crane to lift the locomotive from its trucks, to make repairs, and then replace it on the wheels, all this taking several hours. In the shops of the Chicago and Northwestern at Boone, Iowa, a new electric jack has been installed which makes quick work of the re-wheeling process, as it is called. This machine consists of four large screw jacks built into the concrete floor and operated by a single forty horsepower electric motor. The locomotives as they come in for inspection are first looked over, then if the driving wheels need turning down or re-tiring the locomotive is run over the electric crane, a beam placed under the front and rear of the underframe and the motor started. The engine is lifted several feet off the floor in a twinkling, allowing the drivers to be removed and the faulty ones replaced with new wheels while the old ones are undergoing repairs.

This jack is capable of lifting two hundred tons, and each end of the locomotive may be lifted alone by throwing a lever, or both may be lifted simultaneously, thus keeping the locomotive level.

This is one of the improvements that railway repair men have hailed with delight.



DETAILED VIEW OF THE NEW MONEY WASHER.

SENDING MONEY TO THE WASH

THE realization of the dream of clean currency has come about through the recent perfection by inventors in the United States Treasury Department, of machines that will wash and iron paper money on a large scale at low cost. In the end these will probably save the government a million dollars a year and will likewise prove an economy for bankers in all parts of the country.

The essential feature of the new machine consists of tiers of copper rollers set in an oblong framework—weight about eight hundred pounds—which may be raised or lowered in three seconds and which, when in position for the washing operation, fits snugly into a one hundred gallon tank, filled almost to over-flowing with a solution in which is dissolved a special soap, the formula of which was discovered by the Federal officials. Passing back and forth over the rollers is what appears to the ordinary observer to be a web of cotton duck but is in reality two of these endless bands, fitting snugly one Between these two feet in length, t cleansed and the v accomplished by successive rollers, shaped as to imp motion to the soil

When the washi is, in similar mar forth through the gallon rinsing ta whisks it to anoth which leads over dry the paper and terval of less than the rejuvenated ically delivered to tary machine iron passing them on d drums and then turn to the pressu drums. Each typ but two operativ bills and another crisped money is completion of the

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n in the fine arts. For
stance, one hears a
ainter speak of "color values," "tones of color," and "color transparency." But these are matters reducible to an exact physical basis. The Bureau has already developed a method for constructing what it calls a "rational color scale," and for establishing "primary standards of pure color"—a system which has many industrial applications.

By paying a nominal fee, any manufacturer may have is own measures sted for accuracy. In : manner electric in- ıents of all kinds are and certified; and ıame thing is done ıbout fifteen thousand ıl thermometers an-

MAKING PURE OXYGEN FROM CAUSTIC SODA BY ELECTRO

nually—a guarantee being given with every one that is found correct. This latter, of course, is a matter of no small importance, inasmuch as physicians must be sure of the reliability of the thermometers they use.

Similar tests are made of various other kinds of thermometers, such as are employed in the glass, ceramic, and metallurgical industries, where high temperatures have to be accurately controlled. And then there is the testing of watches, which is being newly taken up. The watches will be run in a warm room, and then in a room near freezing, and every watch found satisfactory will get a certificate to that effect. Later on, standards will be established which will indicate the degree of accuracy to be expected from watches of different grades. The purchaser will be able to obtain a certified watch if he desires; or he may buy a certified clock — the testing of clocks being another branch of work contemplated.

The maker of incandescent lamps wants to know exactly what is a "candlepower." There is no place in the world except the Bureau of Standards where he can find out. The standard formerly accepted was a tallow candle, the illumination given by which varies something like sixteen per c
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A "Cooling Stove" at the Bureau of Standards. Its coils—covered with frozen vapor—are filled with brine chilled by the evaporation of ammonia.

determined is the amount of heat obtained by burning a certain quantity of pure cane sugar. To insure its purity, the sugar is recrystallized in a vacuum. Many samples of it are sent out for scientific use. The Bureau also tests cements, concretes, steels, irons, bricks, clays, rubbers, leathers, inks, paints, mucilages, twines, ropes, and oils—nearly all of such work, however, being done for the government, as a means of determining the quality of materials to be purchased. Paper is tested for fiber composition—by the microscope—folding endurance, tensile strength, etc.

At the same time, all of the knowledge possessed by the Bureau is at the service of the public at large. The manufacturer of woolen or cotton fabrics, for example, can obtain from this source standards by which to measure the length and strength of fibers, the thickness of yarn, the strength of his cloth, etc. Definite and accurate understanding of such matters is a fundamental necessity in his business.

The Bureau has standardized samples of all the commercial alloys used for making steel in the United States. It furnishes such samples to the steel manufacturers, at the moderate price of two dollars apiece, and they serve as "checks," lack of correspondence with them promptly revealing any imperfection in the make-up of the metal mixtures. In the same way samples of brass are supplied to those who want them.

The aneroid barometer, so commonly used by explorers and surveyors for determining elevations above sea level, is not an absolutely accurate instrument. The Bureau is trying to make it much more perfect, and expects it to be useful to aviators. So enormously varied are the activities of this branch of the government, however, that it would be hopeless to try to mention more than a few of them in the brief space here allowed. A point not to be omitted, however, has to do with the accuracy of glass measures, which, in the form of flasks, pipettes, etc., are tested by thousands. A quart cup will not "deliver" a full quart, because some of the fluid remains in the receptacle. Consequently, we have now, for exact measurement, two kinds of quart cups—one that holds a quart, and another that pours out a quart. The precise difference between them must be known, and this has been determined by the Bureau of Standards.

Congress recently gave the Bureau of Standards seventy-two thousand dollars with which to make experiments having in view the development of a new system

for cooling the Senate and House wings of the Capitol in hot weather. Washington is a torrid town during the warm season, and the legislators for the nation suffer severely at times, when sessions run along into the summer.

Brine chilled by the evaporation of ammonia will do the work very satisfactorily, it is expected—the apparatus devised being so arranged that coolness can be turned on in any quantity desired, just as one turns on heat in winter. But the best of it is that the snow which forms upon the pipe-coils of the cold-radiators is derived from the moisture in the atmosphere, so that the humidity (which is what really makes hot weather oppressive) is proportionately reduced, the air becoming dry as well as comfortable in point of temperature.

THE INTERNATIONAL STANDARD METER A
All our measures of length are based on this on

It has been hard, occasionally, to demonstrate to those who are not in direct contact with exact scientific work, the niceties on which those who are responsib of weights, measures, etc calculations. Mathemati the lower, physics, an are an i Thumb-ru or "about go in the oratories. be brougl niceties of and even to perfect scientist s not still proach id Absolut standardiz measures in the ver never be It is a ever, to f careful st tious scie bringing i business chase, suc gage in, their k n them. I example knowledg for the b people.

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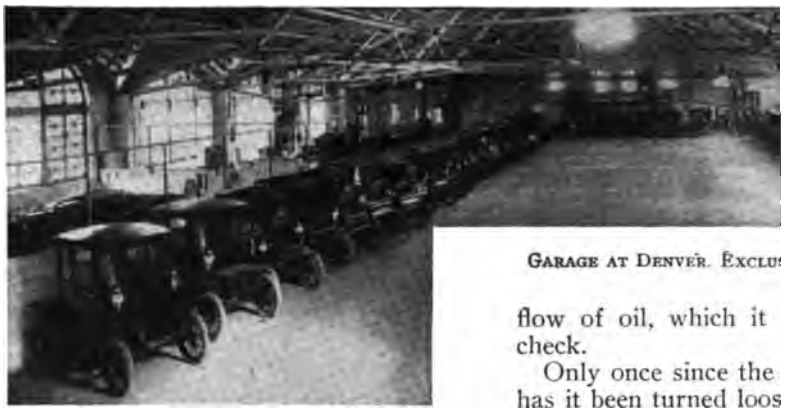

GARAGE AT DENVER. EXCLU

well ran wild more than twelve million barrels of oil were lost. An earthen tank with a capacity of two million, six hundred thousand barrels was constructed and this was quickly filled by the over-

flow of oil, which it check.

Only once since the has it been turned loos ity. In order to satisf ous oil men and scienti field several months a been placed upon the strument was entirely a terrific roar that sho

some distance around, the solid column of oil shot into the air to a height of 491 feet by actual measurement. The flow was permitted to continue unrestrained for twenty minutes during which period careful measurement of the output was made and this showed it to have a daily capacity of 110,000 barrels.

WORLD'S LARGEST ELECTRIC GARAGE

DENVER, Colorado, claims to have the largest exclusively electric garage in the world. Furthermore, extensive inquiry has not yet located so large a one-floor garage for any class of automobiles.

The establishment in question has a floor space of one hundred by two hundred fifty feet, and a capacity of over two hundred cars. It is maintained in connection with a factory and is devoted exclusively to electric automobiles.

NEW ART OF AERIAL PHOTOGRAPHY

THIS picture shows the preliminary stage of taking an aerial photograph. The gigantic tripod, in the foreground, towering far above the building, which is sixty feet high, is probably the tallest tripod in the world, being one hundred feet high.

HOISTING A CAMERA TO THE TOP OF ITS 100-FOOT TRIPOD.

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perform. They are
g and instructive.

GIVING AN EXHIBITION.

SUBMARINES UP-TO-D

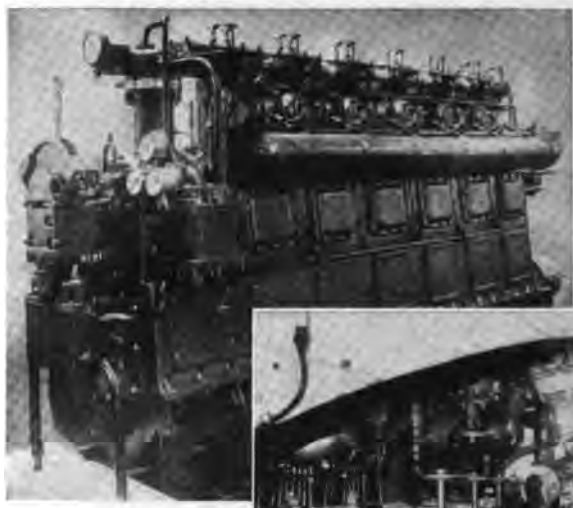
By

CHARLES FREDERICK CART

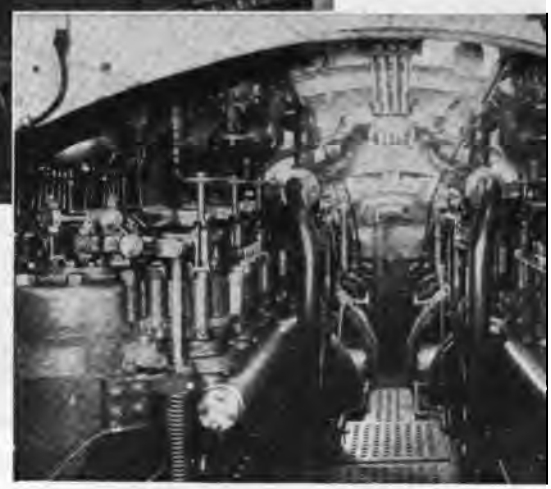
ALL the exploits in Jules Verne's "Twenty Thousand Leagues Under the Sea," once regarded as fantastic flights of fancy, are now commonplaces. Vessels carrying twenty to thirty men now navigate the depths of the ocean at speeds of ten or eleven knots an hour for distances of a hundred miles or more without coming to the surface. They can stop while their occupants get out and take a stroll on the bottom of the sea, just as the characters in that famous story did. Such strolls are neither useful nor pleasant, for nothing is to be gained and nothing can be seen in the murky depths. But the thing demonstrate the pract the escape jackets with submarines are equipp done again if necessary

Nothing surpasses th submarine in picturesqu ity of its development impossibility a score o familiar vessel quite the craft is still a marvel. done almost without t the public is not bec have more than the av the limelight, but to t only customers, natio consider the p air of mystery marine equipm importance.

When the U ernment advert inventors to s submarines, Jo one of three p when bids wer backed by a



THIS CRUDE OIL ENGINE OF THREE HUNDRED HORSE POWER IS ONE OF A PAIR FOR A SUBMARINE.



RATHER CRAMPED QUARTERS.

The engine room of a submarine as seen by one looking toward the stern.

ur more. The new sub-
be of 122 tons displace-
surface speed of eight
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armament consisted of
o tube with two spare
torpedoes. The orig-
inal *Holland* is now a
relic at the Annapolis
Naval Academy.

Against the submarine there is no de-

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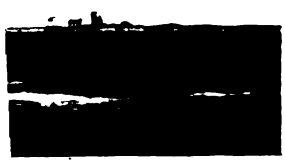

sel without the possibility of detection and it can destroy its victim with unerring precision. At a range of a thousand yards an up-to-date torpedo rarely misses its target. And the two hundred pounds of gun cotton it carries to be exploded only on contact is enough to send the most formidable warship to the bottom in a few seconds. Under these circumstances the wisdom of building fifteen million dollar Dreadnaughts is not visible to the naked eye. The cost of one of these fighting machines would build thirty submarines.

All that a submarine needs to show above the water to observe the movements of a victim is the tops of her periscopes, which are steel tubes four inches in diameter and about twenty feet high above the conning tower. By an arrangement of lenses and mirrors the observer can see objects natural size within a scope of thirty-five degrees. One periscope is kept straight ahead for steering while the other is turned to keep a lookout all around the horizon. It is quite impossible to see these little tubes above the surface at a distance of a few hundred yards unless the submarine happens to be running fast. At a speed of more than six knots the periscopes leave a wake that can be seen for a long distance. All the submarine commander has to do, therefore, is to slow down before rising to the surface.

The absolute reliability of the submarine under all conditions being thoroughly established, it is not surprising to find the leading nations of the world equipped with large fleets of such craft. The following list shows the number of sub-

A SUBMARINE EMERGENCY JACKET AND HELMET DESIGNED TO ENABLE MEMBERS OF TH CREW OF A SUNKEN SUBMARINE TO ESCAPE.

FOR TRANSPORT. IF

and offering all sorts
) clinch sales. The freakiest inducement is being prepared by France. The steamship *Kanguroo,* recently built at Bordeaux, has a special hold into which a submarine, or "submersible" as the French call them, can be floated through a tunnel in the hull for delivery to distant customers!

The Italians, too, build "submersibles" of a type invented by Laurenti. German underwater craft are built by Krupp. Landlubbers might consider the classification of submersibles and submarines as a distinction without a difference. The only apparent difference is that while the submarine is spindle shaped the hull

of the submersible more nearly approximates the lines of surface craft. There are more vital differences not apparent to any but an expert, and which are not readily understood by others.

While it has been conclusively demonstrated—on paper—that the submersible is as much superior to the submarine as the latter is to the former, the significant fact remains that no Holland type submarine has ever been lost, nor has a single life ever been lost on such a craft. Yet in ten years there have been twenty accidents to submersibles, or other submarines, in which one hundred and twenty-nine lives have been lost.

Under these circumstances it is comforting to know that the United States Government has none but Holland type submarines and still more consoling to learn that the requirements of our navy are more exacting than those of any other nation. While submersibles are only capable of descending to a depth of a hundred to a hundred and forty feet at most, no submarine is accepted by this Government until it has undergone the actual test of submersion to a depth of two hundred feet. The boats are really capable of withstanding the pressure at a depth of two hundred and fifty feet.

Should the submarine ever start for the bottom in deep water a safety device is waiting to bring it up again as soon as it reaches a predetermined depth. This device works like the safety valve on a steam boiler. The instant the fixed depth is reached a diaphragm in the outer skin of the vessel yields to the pressure, which opens a cock admitting air at one hundred pounds pressure or more into the ballast tanks, forcing out fifty or sixty tons of water in a few seconds. This tremendous increase in buoyancy, even in spite of a big leak, causes the submarine to dart to the surface at great speed. In tests the boats jump almost out (the water, sinking back with a resounc ing splash.

If a Holland type submarine should l irreparably damaged its occupants sti stand an excellent chance of escape. A four hatches extent down into the hu so as to form escape tubes. The cove have springs to throw them open whe unfastened. If the vessel fills, the pre sure is equalized regardless of depth, s there is no trouble in opening the hatche At the station of every member of tl crew where he can lay his hands on instantly, even if the lights all go ou is an escape helmet with a jacket an belt such as divers wear, together with breathing apparatus with oxygen enoug to last one hour and a life belt. If tl vessel fills the water compresses the a at the top so that the men can sti breathe while they are putting on the helmets. Then they have but to duc their heads enough to get into the bo tom of the escape tubes and so find the way out. Once at the surface they i flate their life belts, then open the wi dows of their helmets to the outer a and wait for rescue. In England a members of submarine crews are traine in this method of escape in tanks bui for the purpose.

A vital difference between the sul mersibles in vogue on the continent (Europe and the Holland submarine use by England, Russia and the Unite States is that the submersibles are bui for high speed on the surface but ca only run submerged at five or six knot while the submarines can run at ten (eleven knots submerged. As these boa are defenseless and therefore useless c the surface in an engagement our Go ernment has insisted on the highest po sible submerged speed rather than c high surface speed.

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LL THE COOKING

WOMAN CHAUFFEUR MAKES A SUCCESS

COLLEGE woman, medical student, chauffeuse and chaperone are a few of the claims to distinction of Mrs. Alice E. Waxham, of New York City, who recently entered the automobile business as the only licensed public chauffeuse in the world. In an advertisement addressed to the women of New York, she offered to take them on shopping trips, visits or on rides for recreation and to act as a chaperone on the automobile rides of the younger people.

Part of her work will be among the convalescents, whom she will take for recreational rides. For this reason a low swung electric coupe is used. The electric was selected because it is clean and noiseless and therefore does not try the nerves of delicate persons. Its easy control commended it for use in the crowded shopping districts.

Starting in with one car which she drove herself, Mrs. Waxham has ordered a second machine. When this is placed in service it will be driven by a young woman who was a class-mate of Mrs. Waxham at Wellesley College.

The time may come when all chauffeurs will be required to be college graduates, though doubtless that will be a distant day.

College Woman Becomes A Chauffeur in New York City.

AN ELECTRIC SPRINKLER

BY means of a twelve-foot perforated pipe extending from the side of a trolley car, the streets of Worcester,

Unusual Sort of Street Sprinkler in Use at Worcester, Mass.

Mass., are sprinkled from a large tan in the body of the car. The device i very cleverly designed to avoid damag to vehicles in case of a collision, as th sprinkler is swung on a joint so that i case it should hit a wheel it would swin back against the car. The space betwee the tracks is sprinkled by another spra so that one-half of the entire road taken care of at each trip. The thre thousand gallon tank is filled from hy drants located between the tracks. Th unusual sprinkler of course sprinkles onl those streets which have car service.

The Annual Carnival Fiesta de los Flores of Los Angeles.
Giant grasshopper outlined with electric lights.

A "Honeybee" of Monstrous Size.

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PHOTO MADE BY MEANS OF THE RADIO-MINERAL. CARNOTITE.

This substance is found at Telluride, Colorado. The illustration is the result of a twelve-hour exposure. The key was placed directly on the photographic plate and the carnotite ore specimen placed on top of this.

majority. In fact, they would appeal to all women.

The population of the Hawaiian islands is less than two hundred thousand. The Japanese, Chinese and Koreans number more than half of these. In spite of the vaunted initiative and skill of the Japanese, the immigrant representatives of that race in the Hawaiian islands are not equal in ingenuity to the German, English, Scotch, Irish or Swedes who come into the United States. They have proved themselves, under white superintendents, skillful workers in the mechanic arts, in Hawaii. They are largely employed, however, as unskilled laborers in the cultivation of the great sugar plantations.

What the careers of these little chaps of the kindergarten will be is entirely another question. Surely under this sort of training the rising generation of Japs in Hawaii should make themselves as much heard in proportion to their numbers as have those in the home country.

LARGEST BOO WORI

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FENCE MADE

THIS unique fence seen in St. Peters encloses the premises

FENCE BUILT OF SEA SHE

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HUGE VOLUME THAT WEIGHS OVER HALF A TON.

FARM MANAGEMENT MADE AN EXACT SCIENCE

By

CARLYLE ELLIS

TO a class of one hundred Cornell students a stick was shown and each was asked for a written guess of its length. Individual guesses varied several inches but the average was 44.7. The length of the stick was 44.1 inches. The error was only a little more than one per cent.

This is a familiar test of the accuracy of averages and its results are always about the same. They are accurate—remarkably so. Upon this fact rests the interest and value of that most modern of statistical inquiries, the farm management survey.

A statistical survey of almost anything threatens to make dull reading at best and to direct it at the management of a mixed lot of farms off somewhere on a railroad hardly promises to lighten the offering. The results are illuminating, however, and interesting, even if one is not a farmer.

A farm survey is a gathering of a multitude of facts about farms, their digestion by tabulation and mathematical mastication and their reissue as a series of known and definitely related factors, in which the human element is conspicuously present. It is a sort of modern oracle that answers almost any possible question about the subject, and there are few of us who would not care to ask at least one such question.

Before me is a two-hundred page pamphlet entitled "An Agricultural Survey of Tomp-

A GOOD TOMPKINS COUNTY—NEW YORK—APIARY.
The average annual receipts from bees were $2.18 per swarm.

kins County, New York, by G. F. Warren and K. C. Livermore." The pamphlet was issued recently by Cornell University from its College of Agriculture and, frankly, it looks al-almost as uninspiring as it sounds. It isn't.

The survey is worked out from field blanks like those used in a Federal census, but much more exhaustive. Especially trained enumerators fill in the blanks with data secured from the individual farmers, and they are checked and rechecked until they are accurate or their inaccuracy has been determined. It required four seasons' work to perfect the system now used.

The statistics required cover the farm capital in detail on two dates a year apart; all the farm expenses, itemized for that year and all the receipts, similarly detailed. There is a full inventory of all stock, from bulls to bees, and of stock sales; an equally particular listing of crops and their disposition and such general questions as rotation of crops, management of manure, number in the family, telephone, years in school, age, acreage in woods, soil type, drainage, etc.

From this extraordinary mass of material come the facts in orderly succession. The first in importance is the item of labor income. That is, what the farmer himself actually receives for his year's labor on his own farm. It is got by deducting from the total farm income five per cent on the invested capital and the value of the unpaid labor of the farmer's family — which is not usually considered.

The average labor income of 615 farmers operating their own farms in Tompkins County—a typ-

MANY HILLTOPS NOW UNDER CULTIVATION WOULD BE MORE PROFITABLE IF ALLOWED TO RETURN TO WOODLAND.

WITH THE USELESS FENCE REMOVED, AS SHOWN HERE, FIELDS ARE COMBINED FOR THE USE OF MACHINERY AND THIS MEANS MORE EFFICIENT FARMING.

IT PAYS NOWADAYS TO LEAVE THE ROUGH LAND AND HILLTOPS IN WOODS, AND EVEN TO REPLANT THEM WITH TREES.

THREE TURKEYS AND THEIR PRODUCT.
The average income was $8.12 for each turkey on hand in the spring.

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A FIELD AT ITHACA, NEW YORK. THAT HAS BEEN A PERMANENT PASTURE FOR THIRTY YEARS.

It is a good example of the result from proper care of pasture land, containing a heavy stand of various grasses.

A NEGLECTED PASTURE JUST OVER THE HILL FROM THE ONE SHOWN ABOVE.

ital, many of whom were known to be able, only one made a labor income of $800. "The possibilities of large profits with so small a capital do not seem very bright," comments the Survey and decides that "one of the weakest points in the farming of Tompkins county is shortage of capital."

It was found that the successful farms had almost the same expense per acre as the failures but were yielding nearly four times as much per acre and in addition had double the acreage. The conclusion was reached that expenses per acre should not be reduced but used more efficiently and the acreage increased to that end.

The average size of the farms in the county is 107 acres. The average owner with less than 61 acres made considerably less than wages. Those with more than 100 acres averaged much more than wages. All the figures showed that larger farms were the more profitable. The chief reason for this is the economy of operation made possible by machinery. The chief item of expense in farming is labor and this is much less per acre on the large farms than on the small. The area that is farmed with $100 worth of labor is six times as great on the largest farms as on the smallest.

The conclusion was reached that a general farm should contain at least 150 acres, and is still more efficient when it covers from 200 to 300 acres, or enough to keep two men steadil employed throughout th year.

Many of the survey findings are so technical a to be beside the purpose o a brief review, but an amazing numbe of points are illuminating and many o them are interesting. For example:

Land in the county is worth from $1 to $90 per acre; the average is $42. Th land valued at about $50 averages high est in profits.

Sixty-four per cent of the farmers sai that their per acre yields were increasin rather than diminishing, a tribute to th progress of soil conservation. This woul indicate that the farmers of Tompkin County, and presumably elsewhere, ar alive to this vital issue.

The average owner who is within thre miles of market makes about four time as large a labor income as the man mor than seven miles out, due chiefly to th excessive loss of time lost in hauling i milk daily.

"Probably the least understood of al the factors that have to do with farmin is the proper use of time," says the sur vey. "No one has given much attentio to the planning of farm work."

Those who have the opportunity an ability to use labor effectively make goo profits from employing it. Those wh direct most labor receive the most fo their own work. It appeared that mos of the farmers who did not have som help would make more money by hirin out.

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Some six years later, Mr. John P. Prescott, a wealthy capitalist of Kansas City was terribly injured in an elevator accident. Everything was done that money could do for the rich man, but he emerged from the hospital with one arm and one leg less than when he entered it. His surgeons set about to investigate the merits of the various artificial limbs then on the market. By one of those curious whims of destiny a chance remark in the smoking compartment of a Pullman car was carried to the ear of one of Mr. Prescott's surgeons and he, with some reluctance and a great deal of incredulity, was persuaded to investigate. The telegraph wires were used without stint and within twenty-four hours a pile of dispatches on the surgeon's desk evidenced the alacrity and thoroughness of the investigation. Carnes, the machinist, was brought on from Pennsylvania and gave a demonstration of his marvelous arm that amazed all who saw it. He was commanded to produce its mate instanter. And later when Mr. Prescott became its possessor he became so enthusiastic that he set up a factory and placed Carnes in charge.

W. T. CARNES, INVENTOR AND FACTORY MANAGER, AT WORK AT A LATHE.

THIS WORKMAN, THOUGH CRIPPLED, RIDES A MOTOR CYCLE.
He can also play the violin.

All day and every day, Sunday excepted, these twenty-four men and the one young woman stenographer, labor at the production of man-made limbs for their fellow unfortunates. There is no atmosphere of gloom in this factory; the employes are as happy and feel as self-reliant as any other employes. Perhaps they feel that the product of their labor is bringing happiness to others at any rate they take great interest in their employment and seem well content with their lot. In the shops their skill is no less than men in other shops and they have won some renown in athletics, for their baseball team recently defeated, in a five-inning game, a scrub nine of the local Y. M. C. A. Certainly this is a fine record for two dozen so-called "cripples."

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ONBILL FISH.

in position. This girder, probably the longest and heaviest of its type in the world, was brought to Worcester from the mills at Steelton, Penn., on a train of five flat cars of steel construction. The total length of the girder is 122 feet 6 inches; its height is 10 feet 11½ inches, and its weight, 1.39 tons per foot. It was supported during transit by shoring against bolsters carried on the nd fourth cars of the train, the being of 10 by 12-inch oak, d by iron plates. The two ars had a capacity of 150,000 ach, the others acting merely

fishes in American waters. Its nearest living relative occurs only in certain rivers of China. Found only in the lakes and rivers of the central United States, its spawning grounds are unknown, and no very young specimens have ever been seen. On this account there is likely to be trouble in obtaining its eggs. A serious biological problem is involved; but the experts are going to do their best to puzzle it out. Sometimes the fish is called the "paddlefish," on account of its long paddle-shaped jaw. It attains a length of six feet and a weight of 160 pounds.

INSTRUMENT FOR RECORDING THUNDERSTORMS.

OONBILL'S LIFE THREATENED

spoonbill cat," or l-nose," is threatextermination, and ility of hatching tificially are beated at the new linn., station. s—not really it related to ns—is the nd most the lakes, on Lake, ith the es of sippi which shery por- com- aken

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THE COMMON OX FLY, MAGNIFIED.

This fly alights chiefly upon oxen and cows. The victims persistently try to get rid of it. Nature has provided the flies with especially good seeing powers so as to avoid the swing of the tail, the dash of the head and the rush through the bushes.

HOW THUNDERSTORMS RECORD THEMSELVES

THE thunderstorm-recorder, or ceraunograph, is a recent addition to the equipment of meteorological observatories.

Every wireless telegrapher is familiar with the vagrant electrical waves that come through the ether from discharges of lightning often hundreds of miles away. These waves, variously known as "atmospherics," "strays," "statics," and "X's," are a source of great trouble to the wireless operator, sometimes causing a complete suspension of traffic. When the usual telephonic re-

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PLANTING COLONIES OF IMPORTED PARASITES, IN WIRE CAGES COVERED WITH CHEESE CLOTH, TO DESTROY WEEVILS.

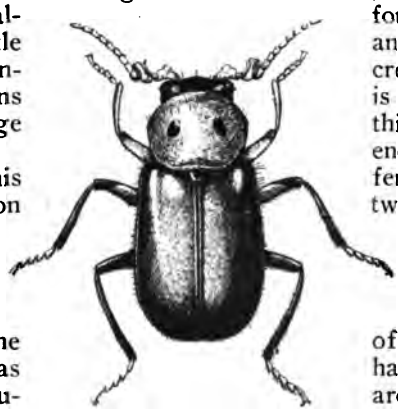
?ORTED WEEVIL DESTROYS ALFALFA

By

R. E. BACHELOR

insect new to this country, that may rival the cotton-boll weevil in destructiveness, has made its appearance in Utah and adjacent sections of Wyo- d Idaho, where it is exciting ut- arm. It is the al- evil, a snout-beetle elated to the cotton- evil, and threatens ost valued forage

native home of this the whole region he Mediterranean where, however, it d in check to a extent by its own l enemies. By some unknown it has d from southern Eu- o Utah at one bound, freed from interfer- y its accustomed foes



NATIVE TIGER BEETLE THAT PREYS UPON THE ALFALFA WEEVIL.

—which, of course, have not come alo with it—it is multiplying and spreadi at a most alarming rate.

The dispersion of this insect is rapi its despoliation terrible. First noticed Utah in 1904, it now covers more th four hundred square mil and the loss to the alfal crop in the infested regi is from one-fourth to on third of the total. It enormously prolific, ea female laying more th two hundred eggs.

Millions of these we vils crowd together the fields, and often a found piled up in stac of considerable size, li haycocks. Sometimes bar are almost completely co ered with their swarms, a the annoyance they cau to men working in t

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In late August
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has been with an *or*
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The best thing to do

NCHES OF ALFALFA.
from a field attacked by weevils.

o check their operations,
he second crop. Being
ith wings, they are able
r species over long dis-
h in the air. Irrigating
es help them to scatter.
revice or aperture, they
carried with articles
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the beetles go into win-
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ed grass or other such
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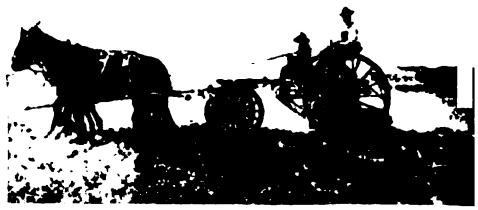
oying the cocoons. It
the larvæ. But it does
of the beetles.
o do under the circum-

stances is to procure the importation o some of these natural enemies, and turn them loose in the alfalfa fields. By good luck, the Bureau of Entomology had al ready in Italy an agent specially skilled in such work, W. F. Fiske.

Mr. Fiske collected large numbers o weevil cocoons, and also many alfalfa stems containing eggs—both eggs and cocoons being sure to be more or less parasitized. He sent the material, packed in small boxes, in cold storage to New York, whence it was forwarded by re frigerator express to Salt Lake City. In addition, he shipped many weevil larva that were infested by parasites.

Most of the parasitic insects concerned are tiny four-winged flies (more strictly speaking, hymenoptera), which lay their eggs either in the eggs of the weevil or in the bodies of the weevil larvæ. To hatch them out is simply a matter o keeping the parasitized material in a suit able receptacle, at summer temperature This is what is done at the laboratories in Salt Lake City and Murray—the ma terial being placed in light-tight boxes through one side of which small glass tubes are thrust. The parasites craw out into the tubes, seeking light, and the tubes are then removed.

Two species of egg parasites were thus obtained, and, several generations o them having been reared in the labora tory, little cages made of wire covered with cheesecloth were placed in an al falfa field. These cages were "over stocked" with weevil eggs by confining numbers of weevils in them. Then when the eggs were thus made ready the parasites were placed in the cages By this means the parasitizing of the weevil eggs was insured, and within ten days a fresh generation of four-winged flies, produced under conditions approxi mately those of nature, was liberated from the cages to scatter abroad.



THE STREET SWEEPER DESTROYS THE LARVÆ AND COCOONS OF THE PEST.

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C CAR FOR TESTING AEROPLANES.

TEST AEROPLANES

w Aerotechnic Institute near has recently been completed occupies extensive buildings ıds at St. Cyr. It is endowed nd of one mil- ırs by Henry and with an income. The to provide a establishment in connection University of order to carry kinds of tests ıeroplane sur- ıelices and the d this will ad- natters considerably in this field. in hall is used to install apparatus study of air movements, and pow- last fans and helix testing appa- vill be used. An interesting fea- an electric car which runs on a ıearly a mile long and is used for measurements on different kinds plane surfaces. Current comes to r by contact rails, and the pilot at an overlooking post on the ıg can run the car at speeds up to ındred feet a second. Instruments e car show the wind pressure on ırface at different speeds. The es- hment is directed by Professor in, and contains a number of labora- , besides an electric plant and a ma- shop. A circular building is being lled for testing helices and aeroplane ıces by running them around a track n arm which is pivoted at the center driven by an electric motor.

BLOWER FOR AIR CURRENTS TO BE DIRECTED AGAINST AEROPLANES.

AN ELECTRIC ANIMAL AMBULANCE

AN animal ambulance, built for tl special purpose of caring for injur or dying horses quickly, is being used Boston. The ambulance is stationed and patrols the congested teaming di trict of Boston's north end. The botto of the vehicle is so arranged that it c be swiftly slid out, in case the animal lying down. Then the afflicted beast rolled over onto this convenient bed a the platform is easily drawn back in the wagon by means of a windlass.

In case the horse is in a standing pos tion, he is drawn in on the sliding pla form and a heavy canvas, running ov rollers and under the horse's stomac keeps him in a comfortable position un he reaches the vete nary surgeon.

Every conceivab emergency has be planned for, it is b lieved, in the equi ment of the animal an bulance. A comple outfit of tools is ca ried, even to a speciall designed steel tripod tremendous sustainir power. This is to l used in case the animal has fallen into hole.

When the police, agents of the socie (and they are vigilant, expertly-train men, too), or a citizen tells, sends phones that the ambulance is wanted, tl machine is on the spot in two or thr minutes.

ELECTRIC ANIMAL AMBULANCE USED IN BOSTON.

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IANT EUCALYPT

:NIA excels in big trees, but y the largest tree in the world is this eucalypt shown in the . Planted in April, 1889, at rs of age it was fourteen feet

THE CHURCH.

es in circumference four inches :e ground. Two years later, or ier, 1911, its girth was fifteen) inches at three feet above the

THE STEEPLE.

ıe quaint little rural church of St. Peter at Warms- near Doncaster, England, there stands a church ıas its steeple placed nearly a mile away. The being so remotely situated, the villagers of Warms- ıever could hear when the bell tolled the time for and the attendance rapidly diminished, so the d vicar had the steeple removed, and the bell now ght in the center of the village.

nd. Its height is 125 feet and its ad of boughs exceeds ninety feet. otanically, the tree is *E. Viminalis,* or na gum. It was planted by J. C. Cubbin, by the wayside, near Reedly, sno County, and has grown untended. : eucalypts are grown from the seed hallow boxes, and transplanted when ut one foot high.

LARGEST TREE IN THE WORLD FOR ITS AGE.

This species is not a desirable timbe tree, but is ornamental and useful fo fuel. The gum tree is the Californi farmer's reliance for fuel in the valleys half an acre about the barn or corral con- stituting the "wood lot." It can be cu inside of five years, and cut perpetuall thereafter, as it reproduces itself rapidl from the stump.

A SCHOOL IN A BAND STAND.

This school for delicate children was recently starte by Dr. Sutherland of the Marylebone Dispensary in on of the band stands in Regent's Park, London. Abou forty children attend the school in all sorts of weathe They are provided with shawls and clogs in wet weathe

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ZZLE OF A CONCRETE AGE

By

GARDNER HUNTING

N the walls of a temple in a deserted city, a priest, in hopeless bitterness, carved the image of a dancing devil. A strong people and l civilization, thriving industry shing arts, a thousand years in were at an end, and the sar- mentator cut a picture-curse, as sm on the works of a dying

ans, proud of their material are today building their young- of the same stuff of which that vas made and are calling their The capering imp has gleefully for five hundred years since he le, in solitary enjoyment of his ver the first American city of

t's a two-edged joke now. Our is ages old even in our own land rein lies the laugh at us. But we igh back at the cavorting demon s contemptuous creator, because crete his people mixed has lasted centuries.

l is the name of the old priest's ilt somewhere between fifteen and n hundred years ago. It lay—and es—in the heart of the jungle in l America. It and its sister towns, er queer-sounding names—Copan, ga, Palenque, Yaxchilan—are just enters of scientific interest because coveries made there by the German rer and archaeologist, Theobert r, and by Dr. Alfred M. Tozzer, working under agreement with the ody Museum of American Archae- y and Ethnology. Tikal is the larg- nd the latest of them to be explored thoroughness. It was a real city a square mile of area for itself and a cluster of suburbs. It is probably oldest of the Mayan cities and was undoubtedly the metropolis from which the civilization of the time radiated; and in it the people possessed something that answered the same purpose and accomplished the same results as the modern concrete-mixer.

The architecture in these northern Guatamalan towns was totally unlike anything else so far discovered in North or South America. The temples and palaces in Tikal, which may be taken as a type of the others, were built solidly of crushed stone and sand and cement, faced with a thin veneer of stone, or with cement in our latest and most approved fashion. In one instance, so far unique in nearly a century of intermittent exploration, there has been found a true arch which could hardly have been made without the use of moulds very similar to those now used in making the arches of reinforced concrete bridges and viaducts. It is probable, too, that the ordinary Mayan arch, which resembles a triangle with the upper end cut off, was also constructed on a temporary support removed after the concrete hardened. In most of the buildings, the retaining walls of light stone remained in position, however, and became solidified with the concrete poured between them.

Thousands and probably hundreds of thousands of people rich and poor, master and slave, ruler and priest, lived, worked and died, and left no trace for the modern explorer in this long lost city. But the walls of the houses in which they worshipped their deities and of the better dwellings stand almost unchanged to be haunts of twentieth century explorers and the panthers of the jungle. The Indians believed the ancient homes were still inhabited by their long-dead builders, and had legends of apparitions seen there and of unholy doings behind those massive walls. So they named

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these "cobbled vaults," as they are technically called. The outside retaining wall was then built, sometimes with the stone set square but more often with the points of the blocks turned inward, so as to present a rough surface. The concrete was then poured between the two walls and settled into all the interstices, hardening into a homogeneous mass. Inside and out, the stones were then covered with a thin veneer of cement and possibly still another face of limestone. It was the effect of masonry thus produced that led observers for many years to believe the walls to be composed entirely of stone.

The single example of the true arch found, not at Tikal but at Nakum, proves beyond a doubt that the supporting temporary arch must have been used much as in our modern practice.

But, solid as the walls of these temples look, there is a well-founded suspicion that there are spaces in the interior of them to which there is no access except by means of the drill. In 1910 a break was found in one of the walls of a Tikal temple, behind the temple-chamber, which looked like some treasure-seeker's work, but which revealed a small room with no other outlet. Remains of similar "rooms" have since been found in broken roof combs. Whether these were mere structural expedients to save weight and material or whether they hold some still-to-be-discovered secret is another lure to the archaeologist's fancy.

The palaces, having no roof combs, had larger rooms, evidently adapted to a system of life that suggests dormitory living by a considerable number of inmates. These buildings are sometimes as high as five or six stories. They are very substantial also, but not so tremendously heavy as the temples, which were even windowless, for no apparent reason except the avoidance of weakening apertures. The dwellings must have had outside stairs, more like our modern fire-escapes, for there seems to be no provision inside for passage from floor to floor. Either ladders or wooden stairs were probably used and have long since disappeared.

THE JUNGLE FOLIAGE HAS ALMOST HIDDEN THE STONE-FACED PYRAMID ON WHICH THIS TEMPLE WAS ERECTED.

The history of the people lies unread in thousands of hieroglyphics on building-walls, on monuments and on shafts that were set up numerously in the public squares.

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lized that the district
would prove excellent for celery-growing. After a number of years of labor and perseverance, he, with the co-operation of others, succeeded in draining and making it tillable.

Although it is constantly drained, the area is nevertheless always rather boggy, and it is because of this condition, to keep the horses from miring in the moist earth, that these mud—or swamp—shoes are used. The horses soon become accustomed to them, and accomplish their work very satisfactorily.

R FOR MODERN SOLDIERS

By

HENRY GARDINER

Germans, who have the
ost wonderful army in the
orld, have long been trying
perfect the cuirass, or ar-
or for the upper part of the
point at which it will be an
otection against modern gun-
fire. Only recently has any success been achieved. So high is the penetrating power of the modern rifle-bullet that any piece of steel or alloyed metals that would resist it would necessarily be so heavy as to be entirely impractical as a portion of a soldier's equipment in the

NTOR. OSCAR SCHAUMANN, SHOWING HIS NEW MUSKET-PROOF CUIRASS MATERIAL TO AN INVESTIGATING COMMITTEE.

ELK IN YELLOWSTONE PARK.

NSPLANTING WILD ELK

By

I. NEWTON GREENE

counties in the State
ıington have availed
:s of a recent offer
the Federal Govern-
purchased wild elks
Park, transplanting
ainous regions of the
. Years ago these
ɔamed in great herds
forest-clad hills; to-
ically extinct because
slaughter long ago
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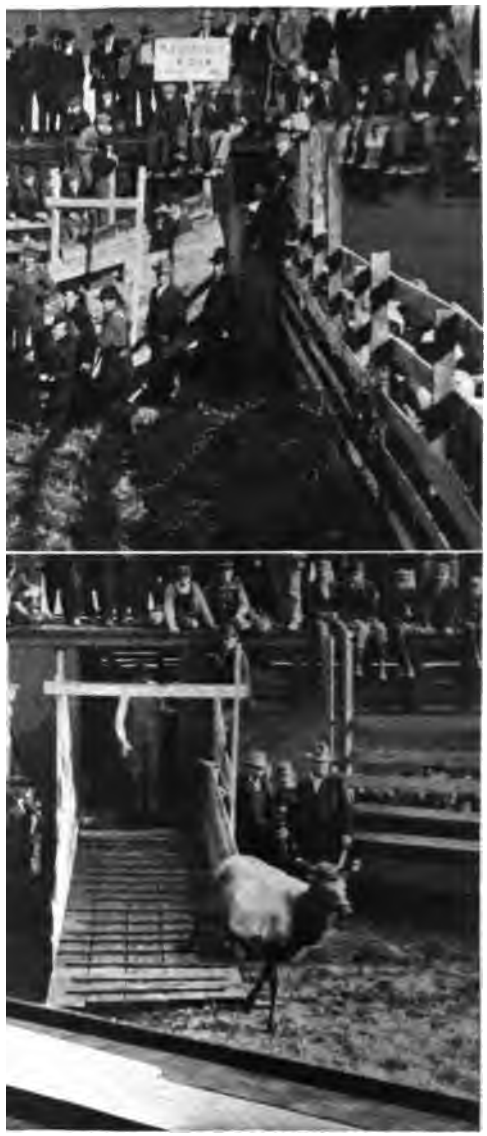
r red hunters. The
Olympic Mountains, extending along th
western coast of Washington, offer
haven of safety for the elks, as the gan
laws thoroughly protect them; but th
Olympics constitute practically the on
feeding ground where elks in any co
siderable number are known to mak
their home in this State, and there is
growing desire to re-establish the bi
game in the Cascade Mountains.

Each winter witnesses the death
many elks in Yellowstone Park becau
the great herd increases so rapidly
cannot be properly fed. This distressin



UNLOADING ELK THAT HAD BEEN BROUGHT FROM YELLOWSTONE PARK TO SNOHOMISH COUNTY, WASHINGTON.

car. After exhausting every known means to bring the timid animals into their corral, men entered the car and grasping the long, silky ears dragged the animals one by one into the open. The first thing most of the elks did upon reaching the ground was to race for the far end of their corral, though others stood motionless from fright and surprise.

POROSITY OF LIQUIDS

WHEN a certain amount of powdered sugar is slowly poured into warm water, the water will dissolve the sugar and appear to absorb it without increasing its volume. Similarly, when alcohol is poured into water, the resulting will be less than the sum of the two volumes. Apparently one of the liquids has entered into the pores of the other.

The experiment as commonly performed in physics laboratories consists in putting measured quantities of the two liquids together, but the effect would be far more striking were it possible for students to see one of the liquids actually soaking into the other. This can be done in this way: Take two glasses, one filled to the brim with water, and the other with alcohol. Color the alcohol with red ink to make it clearer. The glasses should not be over full. Place a sheet of paper over the glass full of alcohol and with a hand on the paper to keep it down on the rim of the glass invert the tumbler over the glass full of water and carefully draw out the paper. This can be done without spilling a drop of alcohol and yet as soon as the paper is removed, the alcohol will commence to drop. Owing to the fact that it is colored, it is possible to see the alcohol actually soaking into the water, while tiny air bubbles that were formerly contained in the pores of the water rise slowly to the top of the tumbler. This will continue until a considerable air space forms in the top of the tumbler.

SUBSTITUTE FOR THE PIT PONY

SINCE the great coal strike in England drew public attention to the sad fate of the sturdy little pit ponies which are employed therein and which are doomed

INSERTING THE GLASS FULL OF ALCOHOL.

to spend their whole existence underground, many worthy folk have been at pains to suggest the use of various mechanical contrivances which shall do the work in the mines which is now performed by the animals. Among the contrivances in question is a small locomotive which is already in favor on the continent of Europe and which can be driven either by petrol or paraffin. It is an

ALCOHOL "SOAKING" INTO WATER.
The result is less than the sum of the two volumes.

) REPLACE PONIES IN

400 tons of stone per day are easily hauled by this useful little engine. Certainly it should be cause for rejoicing among the humane that the day when ponies will cease to toil underground is about at d. Now if machinery could release human toilers also, the millenium ıld evidently be here.

:INDU'S TEMPLE OF BRASS

HE example of Indian brass-work, shown in the accompanying illustra-, is a very remarkable one. It was rely made by the worker who humplies his tools also before the camera who carries the burden of a name ronounceable by English tongues. The ple of brass he has made was years ıuilding and worked out with infinite ence and minute detail. The tools d are all tiny as a jeweler's and the l of hand required is wonderful, for cutting of the brass is clean and fine accurate to plan with decorative de- in marvelous ramification. This :icular piece of brass work is valued ix thousand dollars—by English deal- in stuff of this sort. The native ker never dreamed of such a princely ı, though perhaps six years of his life went into the making of the thing, which, after all, is rather less useful than the space it occupies. If such skill as this workman possesses could be directed into useful channels and a fair price commanded for it, some of the people of India would be farther away from starvation than they are at the present time.

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AS PICTURESQUE AS A ROW OF FIGURES OUT OF A I

STATE PROTECTS I

By

CONSTANCE D.

ONE day last October when the tide of east-bound immigration was running high, Barbis Korodimas stood on the dock of the Austro-American line a few hours before the sailing of the *Argentina*. In his pocket were his steamer ticket and one hundred and sixty dollars in cash. For four years he had been earning seven dollars a week as a laborer in Biddeford, Maine. By scrimping and saving and living like an animal he had been able to lay aside something each month out of his meager earnings and at twenty-six he was returning to his native Athens with his hoarded treasure to invest in a business which should keep him for the rest of his life. With the goal of his ambition within his grasp, he was happy in his

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His steamer ticket was still in his pocket; his savings were gone.

The steamship company promptly called up one of the immigrant aid societies and an interpreter was sent to the dock. A description of the thieves was taken, the police summoned, and a complaint lodged. In the midst of the bustle which attends the sailing of a great steamer, a crowd gathered, friendly, indignant, pitying; a few tried to hazard the suggestion that the thieves might be caught. No one had the hardihood to offer much hope: the stricken boy was like a creature turned to stone, and before the dumb misery in his face the faint words of cheer died on their lips.

When everything had been done, "You still have your ticket," said the interpreter kindly, "and see, the steamer is about to sail; you will go, will you not?"

Then Korodimas roused himself and looked into the face of his would-be friend. The future for which he had slaved and starved through four irredeemable years of his youth had vanished like a dream. Why then should he go back to Greece with empty hands?

"No," said he dully, "I will go back to Biddeford and work four more years."

And as the gangplanks were drawn ashore, the hawsers cast aside and the *Argentina* slid into the channel, the Greek boy walked out into the sunshine of an October day with nothing but bitterness in his heart, and a dull rage against this land of his potential citizenship.

The story of Korodimas is no mere chance instance. It was in appreciation of the fact that there is a whole range of abuses and legal evasions practised exclusively among our alien population that caused Governor Hughes to appoint the New York State Immigration Commission in 1908.

Casting aside as not within their province all questions of federal policy such as the terms of admission and exclusion, the members of this Commission set themselves the task of studying the problem of the aliens now living within the boundaries of New York.

Four-fifths of all immigrants who come to the United States enter through the gateway of New York. They are coming at the rate of over a million a year now, and more than a third of them remain within the State, so that New York is today the home of about a million non-citizen aliens.

It was the protection, distribution and assimilation of these potential citizens that the Commission set itself to work out by study and recommendation.

The result was the establishment, a year and a half ago, of the New York State Bureau of Industry and Immigration, with Miss Frances Kellor at its head.

"If you need advice, come to this office where you will find someone who speaks your tongue and will try to help you free of charge." This legend, printed in seven languages and bearing the address of the Buffalo office of the

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have tagged the lapel of his coat accordingly and this is his only record of his immediate destination. A porter seized him, addressed him in his native *patois*, exhibiting his license shield, which in the immigrant's eyes carried all the dignity of government insignia, said he had been sent from the lodging house to which the other was bound, tore off the tag from his lapel, and had his compatriot at his mercy.

Next, he got possession of the twenty-five dollars without which no immigrant is permitted to land, and then proceeded to lose him. These last offices he performed in a variety of ways. He got the money perhaps by offering to change it into American coinage and giving Confederate bills in exchange; asked for it for safe keeping:

UIDES AND THEIR CHARGES.

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deducted five dollars for a subway ticket; charged an exorbitant cab fare, or resorted to the cruder method of "jostling" and pocket-picking. Then he delivered his charge to a strange hotel where landlord and porter divided the spoils; or, the money in his possession, he found he had an errand in a coffee house and slipped out of the back door while his victim was still waiting for his reappearance. Or perhaps he took him to his destination, fleecing him for services as he went.

The best kind of prey were those aliens who were passing through the city, for they were miles away before a complaint could be lodged against their exploiters. Rarely indeed did the inarticulate foreigner himself lodge a complaint; but when a charge was brought against a porter and the police department revoked his license, he at once applied to the Bureau of Licenses and became a runner, or vice versa. When he had lost both licenses, he would change his name and begin all over again. Just how profitable the wretched business was, a porter indicated in a recent hearing when he boasted that he sometimes made as much one thousand dollars in a week.

NEW BRIDGE AT CONSTANTINE

THIS bridge will connect with the railroad station the new suburb which is being built at Constantine on the old hill at Condiat City, Algeria.

Transporting and placing the pieces of the center arches, an operation both delicate and dangerous was effected by three telecharges, one of long range at the axis of the bridge, the two others above the arches. First there were raised on each side three strut beams held by anchored cables. For raising the central beam a movable foot bridge was constructed uniting the outer strut beams. By means of this foot bridge it was possible to install on some corresponding cables a framework platform on which was placed a scaffolding of timber which served for raising the central beam and its supporting braces, While raising these beams the foundations of the arch were being put in place.

The building of the arch was accomplished in five months. The city of Constantine will possess an admirable work which does great honor to the engineers who conceived it as well as to the builders.

Constantine, the capital of the French department of Constantine, Algeria, was the ancient city of Cirta. It was rebuilt by Constantine. The French took possession in 1837.

A TRACK-LAYING MACHINE.
This, unlike its predecessors, is said to do the work with very little aid from human labor.

NEW BRIDGE

MOTOR S

A RECORD PIECE OF CABLE.
One of two record size cables made in England. This cable is 240 yards long and twenty two inches in circumference. A hundred years ago, long before the chain cable was thought of, hemp cables of twenty-four inches in circumference were made.

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HE MOUNTAINS OF AUSTRIA.

accomplished by gear-
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the desired direction.

The motive power consists of a four-cylinder motor. The transfer of power to the axle of the drum paddle-wheel is effected by cog-wheel chains.

The sled may be fitted with outer wheels by means of which it may be transported to garage over roads free from snow. It is claimed that this motor sled is very well suited as a transportation vehicle in northern regions where snow covers the ground for the greater part of the year.

TESTING TOWER FOR EVAPORATION

FOR some time after the Salton Sea was formed in southern California from the overflow of the Colorado River, there was considerable discussion as to whether this vast inland sea would affect the rainfall in the desert country thereabout. Experts have decided that it has had no effect of this sort, and one of the factors in arriving at that conclusion was the tower erected by the weather bureau over the surface of the water. It contains flat shallow pans of water set at various heights above the sea and accurate observations are taken to ascertain the amount of evaporation at the various levels. It was stated by one authority that the Salton Sea had about as much influence upon the annual precipitation as a tub of water set in the middle of the desert.

: TOWER FOR NOTING EVAPORATIONS IN THE SALTON SEA.

NEW GAMBLE FOR PARISIANS

A CLEVER new device in the shape of a game has come out of Paris, which is attracting considerable attention among those who follow games of chance. The new game is planned along the lines of roulette, except that, instead of wheel and ball, an aeroplane swings around a circle above a table marked with names of six European countries. A tiny plane is mounted on one end of a rod, which rests upon a pivot and is counterweighted at the other end. The plane weighs slightly more than the counterweight and, except when in motion, will sink gently upon the table. The names of England, Germany, France, Russia, Austria and Italy are placed each in a space

about a circle beneath the flight of the plane, so that the little flyer must alight upon one of them when it falls after flight. The players place their bets upon the countries of their choice and the plane is spun by the banker. When the plane comes to rest, lightly and gracefully upon the cloth, the lucky player who chose to bet upon the country in which it lands, wins six times his wager. There is a decided fascination about the novel little game and some players like especially the feature which enables all participants to see distinctly just which section of cloth wins.

TREE WITH UNUSUAL RECORD

THIS photograph is of a catalpa tree which grew from a post planted in the spring of 1878. During the winter of 1877-78 Mr. Charles S. Anders of Fairview Village, Pennsylvania, cut down a number of catalpa trees and prepared them for fence posts. In the spring he planted a number of the posts. The one in question had eight holes in it and was used at the bars. During the summer Mr. Anders noticed a shoot on top of the ground and gave it support. The first season it grew three feet and the following year it attained a height of six feet.

The shoot has been growing ever since and is now a tree measuring seven feet two inches in circumference above the ground. It is forty feet high and has a spread of forty-five feet.

IMPORTING QUEEN BEES

IT is a long and hard journey for bees that come from Europe, packed in crowded mail sacks in the recesses of a steamer's hold. To overcome this disadvantage the Italian exporter provides a special car in which her majesty, the queen, may ride to this land of liberty. She and her associates and the little bit of candy that goes with them are very light, yet the exporter makes a large, cumbersome cage in which she is to ride. The reasons for this are two. First the box must be strong, and second the sides must be extended so as to prevent the surrounding mail from becoming too

closely packe
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AEROPLANE

CATALPA T

HOW QUEEN

ERT HALL, SECRETARY CROP IMPROVEMENT COMMITTEE, EXAMINING THE RESULT OF A "RAG BABY" TEST CONDUCTED BY TWO BOYS.

RAG BABIES TO INCREASE THE CORN CROP

By

ROBERT MOULTON

THE farmers of this country are losing more than half a billion dollars on their corn crops every year. Maybe they don't know it, but they are. And the of it is that this enormous loss be prevented in such a simple and way that to follow it seems like s play.

hat's the matter," the farmers ex-

answer is simple: "You don't test eed!"

y, man alive," the farmer ex- "don't you know that any farmer l good seed corn when he sees it? he can't tell by the way it looks, by cracking it with his teeth or it open with a jack knife."

It is evident that something has got to be done to get these fellows out of the rut. Agricultural teachings, so far, have not had the desired effect. They have been too much along the lines of the old fashioned camp meeting revival. A small percentage of the farmers have been brought to the mourners' bench, so to speak, but the majority of them have backslid, as converts have ever done.

Realizing that old fashioned methods must be supplemented by something new, the Crop Improvement Committee of the Council of Grain Exchanges, who as a body and as individuals are as much interested in the success or failure of the corn crop as the farmer himself, set about to devise ways and means for cracking the shell of the man who thinks

he knows it all because he has "always done it that way." Finally they hit it.

"Eureka," they cried. "We'll teach the men through the boys—the father through the son. We'll establish agricultural kindergartens in the rural schools, and when the fathers and uncles and big brothers see what the children know about testing seed corn, we'll land them."

This is having its effect. The farmers are coming to realize the value and practicability of the methods advocated by the Crop Improvement Committee, and while some of them profess to scoff at these methods, they are secretly putting them into practice.

The method employed in the agricultural kindergartens is the "rag baby test." The "rag baby" bears no relation to little Mary's home-made doll. It is merely a simple little device for testing seed corn, or any other kind of grain, and its mysteries can be solved by any boy or girl in a few minutes.

The "rag baby test" is conducted in the following manner: A piece of heavy sheeting twelve inches wide and four or five feet long is marked off into a dozen or more squares about three inches wide, running through the center of the strip. The squares are numbered, say from one to twelve. An equal number of ears of corn are selected for the test and are numbered to correspond with the squares on the cloth. The cloth is then thoroughly moistened and spread out in front of the ears to be tested. Five or six kernels are taken from ear number one and placed in square number one, and so on until all the squares have been filled. Then the sides of the cloth are folded over so the edges will overlap in the center and the strip rolled up, beginning at either end. If the cloth is well moistened the kernels will not be displaced. After the cloth is rolled up a string or a rubber band is tied loosely around each end, and the "rag baby" is finished. It is not necessary to limit the number of squares to twelve. From twenty to thirty ears can be tested in each roll.

After the roll is tied up it is then placed in a bucket of water where it is allowed to remain from two to eighteen hours, as the operator may prefer. The water is then poured off, the roll placed on a couple of small pieces of wood to keep it from touching the floor, and a damp gunny sack placed over it to keep it from drying out. The bucket is then turned upside down over the roll, one edge of the pail being raised half an inch to give ventilation.

It is important that the corn should be thoroughly moist, but not so wet that seed will smother. Care should also be taken that the corn is not chilled. The best results will be obtained if it is kept in a temperature of about seventy degrees. At the end of four or five days the kernels should begin to sprout. The "rag baby" is then opened up again, the kernels are examined carefully and the boy or the boy's father can see at a glance which the ears are good seed, and which should be thrown away.

The "rag baby" has been born and lived its useful life, leaving Mr. Farmer in a position to plant only that seed which will be sure to germinate and produce a good crop.

Let us suppose that the "rag baby"

SHOWING HOW THE "RAG BABY" IS ARRANGED TO CORRESPOND WITH EARS TO BE TESTED.

HOW SEED CORN IS CLASSIFIED AFTER THE "RAG BABY" TEST.
1, dead; 2, weak, having rootlets only; 3, weak, having sprouts only; 4, strong, having both rootlets and sprouts.

process has been taught to the school children and that every child knows how to do it. Say there are twenty-five pupils in one district school. Each pupil is asked to get twelve ears of seed corn from his father or a relative or neighbor, letting the farmer select the corn according to his best judgment. In this way nearly all the farmers of the district are interested, each man becoming the "partner" of the child to whom he has given the corn. The children then prepare their "rag babies" and keep them at home until the seed begin to sprout.

Finally a day is selected when they are brought back to school for examination and marking. As they are unrolled, one by one, the score is kept on a sheet of paper. The names of the boy, or girl, and his man-partner are placed at the top, then numbers from one to twelve down the side, while opposite the numbers are placed three columns marked "good," "weak" and "dead." It will be found that some ears are wholly dead, and others too weak to plant.

After the result is determined each pupil takes his score-card home to his man-partner and shows him the results. He is also requested to substitute good ears for the bad ones. The pupil next does a little private testing of his own and is then ready for the final testing, at which all of the men-partners are invited to be present.

"The beauty of this plan," said Mr. Bert Ball, secretary of the Crop Improvement Committee, "is that each farmer is put into competition with his neighbor as to his ability to select good seed corn. It is the gaming instinct made practical. Every man is interested if he thinks he can do something better than his fellow. There are several methods to induce each man to see himself as others see him, to learn his true place in the farm equation. One of these is to give each man a number according to his ability to raise corn, based upon his own signed statement. The idea is, of course, to prevent those below the average from placing all the blame upon Providence."

NEW ATTACHMENT FOR PHONOGRAPH

THIS clever device is adjusted so that the owner of a phonograph can take his ease while the record is playing and not have to stand over the instrument in order to stop it when the piece is ended. At the conclusion of the selection the metal arm of the phonograph touches the perpendicular lever, shown above the hand. This forms a closed circuit for the tiny electric brake, which is instantly applied, and the adjustment is so delicate that the record can be stopped at any given point. Aside from the dry-cell, the outfit is very compact, being enclosed in a metal case the size of a pocket match-box. A couple of screws hold it to the case of the instrument, where it is quite inconspicuous. It is the invention of a young Los Angeles electrician and is known as the record-stop.

This improvement should add much to the pleasure derived from and increase the immense popularity of the phonograph.

NEW ATTACHMENT FOR THE PHONOGRAPH.

NOVEL MOTION PICTURE THEATER

A MOTION picture theater in M waukee, Wisconsin, has a seash room where mothers may leave th children while watching the photopla Sand-piles, shoot-the-chutes and ot things for amusing children are p vided, with a scenic back-ground.

CHILDREN'S QUARTERS IN NOVEL MOTION PICTURE THEATER, MILWAUKEE.

ONE OF THE IRRIGATION DITCHES BEING BUILT IN COLORADO.

HUGEST OF IRRIGATION DREDGES

WHAT is said to be the largest dredge ever used on an irrigation ditch is now lifting mud from the bottom and cutting to twice its original width a big supply canal. The canal runs from the Arkansas River, near Rockyford, to Las Animas, Colorado, a distance of over one hundred miles.

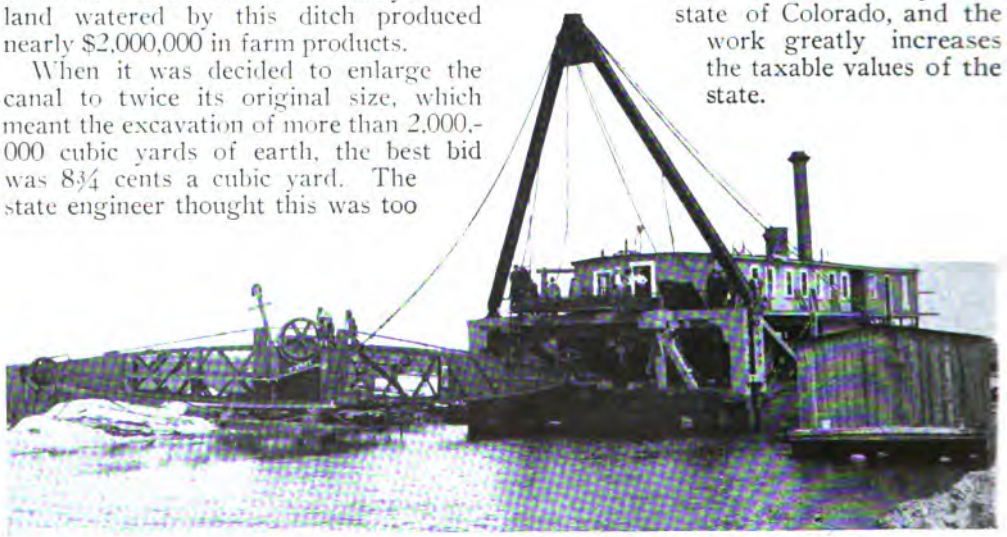
This is the largest ditch in the state and is being built with state capital. Its rights, franchises, priorities and properties are valued at $12,500,000, and a conservative estimate shows that last year the land watered by this ditch produced nearly $2,000,000 in farm products.

When it was decided to enlarge the canal to twice its original size, which meant the excavation of more than 2,000,000 cubic yards of earth, the best bid was 8¾ cents a cubic yard. The state engineer thought this was too much, so the state bought a dredge and started to work itself. The dredge cost the state $36,000, but, it is estimated, it will save more than $30,000.

The dredge is two hundred feet long, ninety feet wide, has a one hundred-foot boom and a four and one-half-yard scoop. It is equipped with double boilers and compound engines, and every modern improvement has been installed, including an electric light plant.

It will take two years to complete the work at the present rate that excavation work is being done.

This is one of the biggest enterprises ever undertaken by the state of Colorado, and the work greatly increases the taxable values of the state.



THIS IS SAID TO BE THE LARGEST IRRIGATION DREDGE IN THE WORLD.
It belongs to the state of Colorado and has given most excellent service in improving the value of the land.

TRAIN STOP SIGNAL DEVICE IN PLACE.

DEVICE TO STOP TRAIN WRECKS

AN American device that it is hoped will absolutely prevent trains coming together at junctions, crossings, switches, and in the signal blocks; eliminate the present derailments; stop trains when the rails or the mechanism have been interfered with; and in fact make an accident almost impossible, has recently been invented.

The device is of simple construction and railroads may be equipped with it at comparatively low cost. The track mechanism consists of a flexible steel arm set on a low standard, the arm being parallel to the rails when the track is clear and at right angles when danger threatens. On the breast beam of the engine is another small mechanism from which projects a thin steel finger. When the latter comes in contact with the track device, as it does when the danger signal is set, the air brakes are instantly applied and the exhaust steam valve opened, bringing the train to a stop quickly and smoothly. In all of the trials with heavy or light trains, on dry or wet rails, the device worked almost perfectly, the trains being stopped within a minute and within from 50 to 2,500 feet, depending upon whether the trains were speeding six or seventy-five miles an hour. The device is interchangeable, can be operated in connection with any existing signal system, by manual, electro-pneumatic, or electric control, or can furnish its own system, if it is necessary that it be required to do so.

LONDON'S PLAYFUL POLAR BEARS

THE "ice" bears—or polar bears—in the London Zoological gardens are one of the chief attractions in that popular public resort where the thousands of the crowded metropolis's people throng on Sundays, bank and other holidays. The bears are sufficiently playful and demonstrative to be a source of constant delight and pleasure to the spectators. To see these huge animals clumsily lumbering along on land one would certainly not think them capable of the agility and

SHOWING THE MECHANISM OF THE TRAIN STOP DEVICE.

liveliness which they display in the water.

The illustrations show one of these bears amusing himself with a block of wood which has been tossed him. This block, which weighs several pounds, he delights in hurling through the air with his huge paw and then retrieving it much as a kitten would a ball.

POLAR BEAR PLAYING WITH A BLOCK OF WOOD.

The polar bear is the only known species of bear which is strictly marine in its habits, never being found far from the sea. It does not therefore delight so much in staying in the water, as seen in the zoos in summer, because it is accustomed to a more frigid temperature, but largely through its natural affinity for this element.

THE BEAR DIVING FOR THE BLOCK.

In other ways, also, the polar bear is quite distinct. Most species of bear are omnivorous, eating nearly anything. The polar bear, however, eats almost solely fish and seals, preferring the latter.

PEARLS FROM MARINE "SILKWORM"

NOW that pearls are advancing so greatly in price, and with a fashionable demand for black pearls, there is an opportunity along the shores of the South Atlantic and Gulf States for the development of a new and profitable molluscan fishery—the mollusk concerned being the pinna, which is otherwise and poetically known as the "silkworm of the sea."

This interesting bivalve not only spins a very beautiful silk, which is utilized to some extent commercially, but produces a surprising abundance of jet-black pearls. Dr. Benjamin H. Grave, of the University of Wyoming, recently made a study of it in the neighborhood of Norfolk, Va., collecting large numbers of specimens, and he obtained an average of one pearl from every five of the mollusks. As many as ten were found in a single shell.

The pearls of the pinna, which are usually spherical and highly-polished, are already used to a considerable extent, in countries bordering on the Mediterranean, for the adornment of brooches and other articles of jewelry. There is no reason (says Dr. Grave) why they should not be employed much more widely. The matter is simply one of fashion. And, inasmuch as the mollusk is a common species all the way from Cape Hatteras southward, it could easily be made to yield a large annual crop of such pearls.

It is up to enterprising Americans to get busy and develop this new and important industry.

THE PINNA DISSECTED AND THE FIBER IT SPINS.

PINNA, OR "SILKWORM OF THE SEA," AND A GLOVE WOVEN FROM THE FIBER IT SPINS.

DIGGING OUT PEAT TURF.

MORE LIGHT ON PEAT FUEL

By

AUBREY FULLERTON

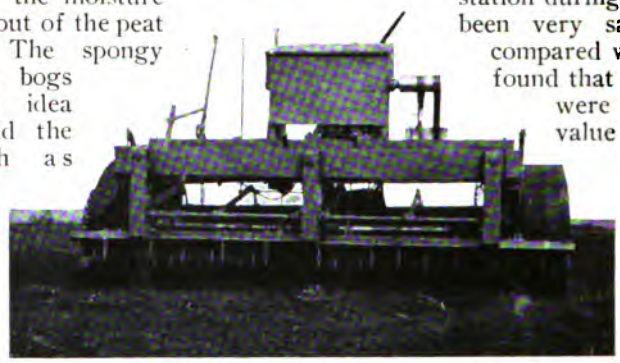
WE would be burning peat instead of coal were it not for its excessive wetness. As it comes from the bog it has from eighty to ninety per cent of water in it, and to dry out to less than twenty-five per cent has been the long-standing difficulty of the peat-fuel producers. They have been experimenting, in both the United States and Canada, for several years, and now, after many failures and half-successes, they have pretty nearly solved the problem.

Recent investigations have been conducted chiefly under government auspices. The United States Geological Survey is making a thorough study of the peat resources of various states, in the hope that a practical fuel may be found that will be at least a partial substitute for coal. In Canada the Mines Department of the Federal government has for the past two or three years been conducting a series of experiments along the same line, and with a considerable degree of success. Canada has special reason to be interested in the possibility of a substitute fuel, for while she has immense coal deposits they are at the extreme east and the extreme west, leaving the middle provinces largely dependent, for both domestic and industrial fuel, upon the American supply. At the same time, she has great stretches of peat bog, and the utilization of these is therefore a thing most practical and desirable.

In 1909 a demonstration plant was established at Alfred, Ontario, forty miles from Ottawa, where there is an immense peat bog of several hundred acres, averaging eight feet in depth. At the same time a fuel testing station, equipped with modern machinery and appliances, was built in Ottawa. Both works were opened in the early part of the following year, and for two summers peat-fuel has been made at the Alfred plant and tested

at the station in Ottawa. The purpose was, not to initiate a peat-fuel industry on a commercial scale, but merely to demonstrate the suitability of the European methods to conditions in America, and to show that a good and serviceable fuel from the numerous bog-lands is entirely possible.

One of the wrong theories on which some of the earlier experiments were based was that the moisture could be taken out of the peat by pressure. The spongy nature of the bogs suggested the idea that they held the water much as sponges do, and that, like sponges, their raw material could be squeezed dry. But it was found that there was a very great difference: peat holds water not as a sop but as a very part and parcel of its make-up. Pressing it dry had to be abandoned.



A Type of Peat Excavator, Electrically Driven, in Use in Ontario, Canada.

Next came various attempts to steam-dry it. Machines that were really ingenious were fitted up, one of them comprising a revolving drum in which the powdered peat was subjected to a high steam-heated temperature. Drying it out on heated cylinders was also attempted. Good fuel was obtained from all these processes, but the cost of operation was such that none of them could be carried on economically.

Air-drying was left as at once the simplest and the most successful method. Five miles of ditches were dug on the Alfred bog, to drain it, field tracks were laid, and a peat machine was installed. In the summer of 1910 peat was made during a period of fifty days, though average weather conditions will permit a manufacturing period of twice that length. In the fifty days some sixteen hundred tons of peat-fuel were produced, about half of which was sold for private use and for official testing. One ton of the manufactured fuel cost $2.25; landed in Ottawa it cost from $3.25 to $3.50, at which figures it was sold to householders. In 1911 the cost of transportation and distribution ran a little higher, and the price to private users was $3.80, admittedly a bit too high for the grade of fuel. In the face of high freight rates the process of manufacture must be somewhat cheapened before peat fuel can be used as a really economical substitute for coal.

The tests of the fuel at the government station during both years have been very satisfactory. As compared with coal, it was found that 1.8 tons of peat were equal in heat value to one ton of anthracite, and as a power producer two-and-a-half pounds of it furnished one horsepower-hour as against one and a half pounds of soft coal. An Ottawa householder who had been accustomed to burning eleven tons of anthracite during the winter stocked fifteen tons of peat instead, and it carried him through. The coal cost him $7.50 a ton, and the peat $3.25. To make as good a showing as this, however, the peat must be of number-one quality and well dried. It is best adapted to open-fire grates and cooking stoves, but if rightly used it will give very good results also in furnaces. It burns brightly and cleanly, leaving a fine ash which is of some value as a land fertilizer.

Tests were also made for producer gas. If bogs and marshes give out gas in their natural state, why should not bog peat yield a gas of some commercial value? A retorting plant was equipped at the Ottawa fuel station and a thorough test made, with peat of seventy-five per cent moisture, chemically treated. The results were carefully tabulated, and in general they were these: peat will produce a gas of about the same calorific value as coal gas, but not economically. One ton of peat produces 8,650 cubic feet of gas, and the time required to retort it was five times more than for

coal. As a byproduct, however, peat gas is practicable, and in Austria and Russia it is used for lighting in plants where peat coke is made.

In the way of byproducts also, moss litter and peat mull have a commercial value, the latter being shipped from Holland to the United States at about sixteen dollars a ton. It is used as a fruit packing.

The method of manufacture adopted at the Alfred demonstration plant is simple. The peat machine, operated by steam, is set up on the bog, and the raw peat is carried to it by a conveyor directly from the digging. It granulates, presses, and moulds the peat, and empties it out into dumping cars in the form of rough bricks. These peat bricks are then spread on the ground to dry, the rest of the process, save for an occasional turning, being left to the sun and wind. That is all there is to it. It is a matter chiefly of good out-door ventilation, for the wind is a better drying agent than the sun.

But while artificial drying has been found to be impractical, machine digging is believed to be the secret of a further cheapening of cost. If the peat must be dried by simple weather process, it must be dug by some quicker and cheaper method than hand labor. A machine excavator has been made that is driven by electrical power, slices off the bog-soil and throws it, in powder form, to one side, where it partially dries and is then gathered up for the press. In this way the cost of manufacture can be reduced at least fifty cents a ton.

The Canadian Mines Department has proved it by its two years' tests that bog peat can be converted into an effective substitute for coal, for both domestic and power purposes. It has found, however, that to be made economically it must be made near at hand, and the transportation to great distances of air-dried peat fuel is not recommended. What is advised instead is that plants be erected at convenient points to serve their immediate communities, it being entirely possible for a number of farmers to operate in this way and profitably to supply the local markets with a home-made fuel. A plant like that at Alfred, with a capacity of some thirty tons a day, can be erected for about $7,000.

That this is a practicable suggestion, so far at least as central Canada is concerned, is apparent from the fact that there are known to be in the provinces of Quebec, Ontario, and Manitoba areas of peat bog totaling 36,000 square miles, with an estimated possible production of 28,000,000,000 tons of air-dried peat fuel. Some ten or twelve bogs in different parts of the country have been carefully examined and delimited by the government's expert, and one of these, in Simcoe County, Ontario, covers over 16,000 acres, is free of trees, and is estimated to be capable of producing 9,000,000 tons of fuel. The prairie provinces also have great areas of bog which could be developed with very great advantage to a country that needs fuel and that must otherwise bring it in from long distances. As a matter of fact, there is enough incipient fuel in Canada's bogs and swamps to make middle provinces practically independent of the coal-dealers: what yet remains to be done as a preliminary is to put the peat-fuel process on a commercial basis by a little further cheapening. This seems now to be within reach. The government tests have been educational and demonstrative, and they are to be followed during the present year by private development on a business basis.

A still newer and possibly better process of peat-fuel manufacture has been discovered in Sweden. It is a process of wet-carbonizing the peat, by which it is claimed that continuous manufacture can be carried on, independent of air-drying. The Swedish government has made an appropriation for further experimenting, and the results will be awaited in this country with interest.

If Canada can dry out her bogs and burn them, as it seems likely that she will soon be able to do, it will be one of the best pieces of nature-taming up to date. And it will be a welcome antidote to the increasing coal bills that vex the ultimate consumer.

RECENTLY HATCHED TROUT WITH FOOD SACK.

WATCHING LIFE GROW

By

EDWARD F. BIGELOW

EVEN within the egg the life actions of the embryo trout may be seen. It is a marvelous revelation of the circulation of blood that is shown by focusing upon the egg sack. The radiating fins possess a network through which, under a high power objective, the oval corpuscles are seen to rush with great speed. They gather at the lower edge of the egg sack into one great channel or river. Then this current may be readily watched as it passes to the heart, of which the two parts—the auricle and the ventricle—alternately contract and suggest to the observer the thought of the walking beam of a steamer. From the heart the current may be traced to the gills each chamber of which stands as a dome-shaped receptacle. Around the top on the inside rush these corpuscles in a series of pulsations synchronous with the rhythmic beating of the heart. From this heart, the blood purified and in readiness to sustain the animal is carried throughout the entire organism. To aërate the blood there must be a constant supply of oxygenated water and astonishing is the provision that nature has made for this.

The director of a fish hatchery who supplied the eggs shown in the photographs gave instructions to keep a current of water on all sides of the eggs, above as well as below, and he advised that they be suspended on wire netting in a current, and the question naturally arose, How does the egg utilize this oxygenated water? The microscope explains the miracle. Within the egg is a small amount of water that is kept flowing over the gills by the steady action of the pectoral fins. These fins may be seen work-

ing within the egg as regularly and as steadily as the oars of a rowboat in its passage across the lake. It seems evident that this mechanical action is intended to keep the small quantity of water circulating within the egg, so that every part of that water shall first touch the interior of the thin shell through which

THE EGGS OF THE TROUT.

the oxygenated liquid undoubtedly passes by osmosis.

In all the realm of nature there has never been found so complete a biological machine.

After a few weeks in this current of water the embryos burst their shell and for a few days their life action may be seen even better than before, but for only a few days. As the trout grow older a pigmentary substance appears and obscures the view of certain parts of the fish. So that the finality of the egg stage and the beginning of the perfect form are the best in which to witness these mysteries of all mysteries—the functions of life. For many years the circulation of the blood has been shown to biological classes in the web of a frog's foot or the tail of a fish. These objects have become classical and indeed they are marvelous, but they in no way approach the impressiveness, the feeling of awe induced in the observer's mind by the tiny trout's manifestation of some of life's phenomena.

Merely Thinking

"Great sale, eh?" commented the advance agent. "Been a line in the lobby for several hours."

"Same six people, though," explained the man in the box-office. "Same people you saw an hour ago. The line is being held up by a lady who is thinking of buying a seat."—*Washington Herald.*

Wanted to Know

He—"My father weighed only four pounds at his birth."

She—"Good gracious! Did he live?"—*Boston Transcript.*

Tiresome

Edith—"Why did you dismiss Mr. Goodheart?"

Blanch—"Oh, he got so he'd rather sit at home and hold my hand than take me to the theatre."—*New York Weekly.*

Poor Child

Regular Customer—"I shall want a large quantity of flowers from you next week, for my daughter's coming-out."

Flower Woman—"Yes, mum. You shall 'ave the very best for 'er, pore dear. Wot were she put in for?"—*Punch.*

In the Suburbs

"Is Mrs. Gillet a well-informed woman?"

"Well, she's on a party wire."—*Life.*

A Mortal Blow

"What's the matter with your wife? She's all broken up lately."

"She got a terrible jar."

"What has happened?"

"Why, she was assisting at a rummage sale, took off her new hat, and somebody sold it for thirty-five cents."—*Washington Herald.*

Impossible Demand

"But," her father objected, "you have never shown that you are capable of supporting a wife."

"Oh," the young man replied, "if you want her to marry a widower I'll have to confess that I can't qualify."—*Chicago Record-Herald.*

The Reason

Rumm—"What the dickens does Congress mean by authorizing the coining of a half-cent piece?"

Dumm—"Why, it will enable married women to have a little change now and then."—*Cincinnati Enquirer.*

More Barbarous Latins

Mrs. Greening—"And what does this statue represent?"

Mrs. Browning—"That is Psyche executed in terra cotta."

Mrs. Greening—"Poor thing! They are so barbarous in those South American countries."—*Boston Transcript.*

Reduced Club Rates

MR. SUMMERMAN—"Is it true that since coming up here you've engaged yourself to Billy, Harry, Ed, and George, as well as to myself?"

MISS SWEETLY—"What if it is?"

MR. SUMMERMAN—"Then I'd like to know if you have any objection to all of us chipping in to buy the engagement ring?"—*New Orleans Picayune.*

Taste and Diplomacy

"SHE had him arrested for kissing her forcibly, and he was fined $200."

"Yet they are good friends now."

"Yes; he announced in open court that it was worth the money."—*Washington Herald.*

Identified

"THAT was the spirit of your uncle that made that table stand, turn over, and do such queer stunts."

"I am not surprised; he never did have good table manners."—*New Orleans Times-Democrat.*

Unimportant

MARION (just from the telephone)—"He wanted to know if we would go to the theater with him, and I said we would."

MADELEINE—"Who was speaking?"

MARION—"Oh, gracious! I forgot to ask."—*Judge.*

A Natural Question

A FOUR-YEAR-OLD listened attentively while his mother sang:

"They have fitted a slab of granite so gray,
"And sweet Alice lies under the stone."

"Was she mashed, mama?" he asked.—*Everybody's.*

Revenge

LANDLADY—"You believe in mustard plasters, doctor?"

M. D.—"Rather! I always order them for patients who call me out in the middle of the night when there's nothing the matter with 'em."—*The Scalpel.*

Solely a Family Affair

MURPHY—"Oi want to get a fust-class autymobile for me woife."

AUTO DEALER—"Long body?"

MURPHY—"None of your business! She's built like a barrel, but Oi didn't come here to discuss her shape wid ye."—*Puck.*

Terrible

"WANTED: A governess who is a good stenographer, to take down the clever sayings of our child."—*Fliegende Blaetter.*

Drowning the Storm

MRS. A.—"What did your husband say when he saw the bill for your new gown?"

MRS. B.—"I didn't hear. I started to play on the piano."—*Boston Transcript.*

Getting It All

THE DOCTOR told him he needed carbohydrates, proteids, and above all, something nitrogenous. The doctor mentioned a long list of foods for him to eat. He staggered out and wabbled into a Penn Avenue restaurant.

"How about beefsteak?" he asked the waiter. "Is that nitrogenous?"

The waiter didn't know.

"Are fried potatoes rich in carbohydrates or not?"

The waiter couldn't say.

"Well, I'll fix it," declared the poor man in despair. "Bring me a large plate of hash."—*Pittsburg Post.*

WHERE ELECTRICITY COMPETES WITH COAL

By

RANDALL R. HOWARD

IT is being demonstrated by the Federal Government on the Minidoka Government Reclamation project in Idaho that electricity can compete with coal for heating and cooking purposes.

Of course, conditions are especially favorable, for this project has what is stated to be the largest water pumping plant in the world. A total of ten thousand electrical horsepower is available during the summer months for lifting water for the irrigation of forty-eight thousand acres of land. But this great quantity of electrical energy is not needed during the remaining eight months of the year. Hence it is being sold by the Reclamation Service to the settlers on the project, for light, for heat, and for other domestic uses.

The Government does not purpose to make a profit from the sale of this surplus electricity, and the winter heating rate is extremely low—one dollar per kilowatt month. This amounts to about thirteen-hundredths of one cent per kilowatt hour—while an ordinary rate for electricity from private companies in cities is a maximum charge of fifteen cents and a minimum charge of five cents per kilowatt hour. The winters are rather severe in this part of the West, but the Government rate enables the settler to heat an ordinary room for a total annual cost of between ten and fifteen dollars.

The settlers are encouraged to allow their electric heaters to burn all night, since the loads on the generators at the big power plant will be more equalized. Thus, the householder will have the luxury of a warm room when he arises on a cold winter morning. He also will find hot water for coffee, and his oatmeal ready cooked. The electrical transmission system has not yet been extended to all parts of the project, but where it is extended, even the most humble shacks and tents may be lighted and heated with electricity. Ordinarily, electrical appliances for heating and cooking are considered extreme luxuries, since the first cost of such household furnishings is usually very high. But on the Minidoka project this condition has been met by developing working models for the manufacture of cheap stoves for heating and cooking.

With the aid of these models a handy man about the farm may make his own electric stove. If he does not have the materials, or is not handy, the village tinsmith can do the job cheaply. True, these stoves betray that they are homemade, but they are efficient and can be made attractive enough even for a fastidious town or country housewife.

When the transmission lines shall have been extended to all parts of the project, this cheap electrical energy will have many other uses than for heating and cooking. A certain amount of cheap power will be available even during the summer months, and electrical fans will not be a luxury in the farm houses—to say nothing about churns, feed choppers, and wood saws.

This unique electrical power plant that is competing with coal has a most strategic location. A considerable part of the regular water flow from the Snake River had already been appropriated to use when the engineers of the Reclamation Service located the dam site for the large Minidoka project. This water was being taken from the river at a lower point, hence must be allowed to escape the Government dam which raises the

surface of the river thirty-five feet. But there was nothing to prevent Uncle Sam from stripping this appropriated water of its power, as it passed through his Minidoka dam.

Accordingly, the largest power plant of the Reclamation Service was constructed, developing five units of two thousand horsepower each. The engineers did not stop here, planning to play the game for all it was worth.

DIVERSION DAM IN THE SNAKE RIVER.

ONE OF THE PUMPING STATIONS.

THE HOUSE OF A NEW SETTLER.

The water pumping system on the Minidoka project is already the largest on the continent. It is stated that the second largest pumping plant is a part of the city drainage system of New Orleans. But the Minidoka giant pumping plant does not suffer in comparison, for the city pumps at the other corner of the continent are said to lift only about one-half the amount of water raised by a single one of the three different pumping stations on the Minidoka project.

Each of these three pumping stations lift the water approximately thirty feet. The sight is indeed most strange—to see wide canals of water flowing abruptly into the side of a ridge. The water disappears at the edge of low cement buildings, where the continuous whirr of machinery may be heard. But several hundred feet away, and farther up the ridge, streams again boil up like great springs, and are carried off in concrete-lined canals. The first pumping station is thirteen miles from the Minidoka dam; and the second and the third are respectively a mile and a quarter, and a mile and a half from the first station. Some of the rural residents of Idaho are said to have been highly skeptical that the slight copper wires would be able to lift the stream of water from the canal, when the giant pumping plants were dedicated, and they came for miles to see such a remarkable wonder as this. Their doubts were speedily quashed, however.

The power plant was so constructed that its capacity may be doubled, should the need arise. A great deal of water goes to waste during the spring flood flow of the Snake River, and it was gambled that the time will come when a part of this water will be stored and conserved for irrigation. When that time does come, the Minidoka dam will strip more water of its power, and more electrical energy will be available for summer irrigation and to compete with coal during the winter.

THE SIZE OF THE SEEDS DISTINGUISHES THE HARDY FROM THE WORTHLESS.
Hardy catalpa seeds are large.

THE GET-RICH-STEADILY CATALPA

By

HARLAN D. SMITH

WHAT C. D. Robinson of Pawnee City, Nebraska, did with catalpas was nothing unusual but it is a good instance to cite because it shows what any farmer can do on a small piece of land. This is according to C. A. Scott, State Forester of Kansas. Mr. Robinson harvested a small crop of twenty acres not long ago. His profit was $152.17 an acre, or $3,043.40 for the entire crop. This was above interest on his investment for sixteen years at five per cent.

In establishing, maintaining, and harvesting his grove, Mr. Robinson hired everything done and paid good wages. He could easily have done most of the work himself at odd times and saved one-half the expense.

Nobody knows how many millions of rich acres in the Missouri Valley remain idle year after year because of spasmodic high water. Count only those acres lying close to river and creek banks—those very uncertain areas that are excellent farm land one day and a river bed the next—and you'll have a good many millions in your estimate.

Yet on this very waste land a new and profitable industry will start some of these days. It will be catalpa growing. The ever-increasing demand for catalpa posts and poles will bring it about.

Catalpa growing is not a get-rich-quick scheme. Requiring eight to sixteen years for a crop to mature, it isn't a quick investment. But there is mighty good money in catalpa growing and where the soil is good it is practically an absolutely safe investment.

Some Kansas catalpa plantations are being harvested now with promises of large profits. Charles Delker, of Hudson, who has one hundred thousand trees, is cutting posts which he says will bring

SIXTY THOUSAND POSTS, WORTH FROM FIVE TO FIFTEEN CENTS APIECE, AND 650 RICKS OF STOVEWOOD WERE SECURED FROM TWENTY ACRES.

a gross income of five hundred dollars an acre. W. W. Hall, who also lives near Hudson, has a plantation of sixty thousand trees.

"I will begin to cut mine in two years," Mr. Hall said. "I expect to harvest five hundred dollars' worth to the acre. During the last eight or ten years while you are waiting for the crop to mature you don't have to give the trees any care. I believe it beats wheat raising on my land."

The *catalpa speciosa* or "hardy catalpa" is the only catalpa worth planting,

Kansas' State Forester says. The more common species, *catalpa catalpa,* is not profitable. It is a very difficult matter to determine if seedlings purchased for planting are true to name. Seedlings of all species are so much alike that it is practically impossible to tell one from another. It is only from the characteristics of the mature trees or the seeds that the common and the hardy species can be determined, definitely. And then it requires a close comparison of the points of identification.

One-year-old seedlings are the most satisfactory for extensive plantings. At this age the young plants are strong enough to establish themselves readily in their new location, and to make a good growth the first season. They also can be planted at a much less expense at this age than when two years old. The catalpa is very readily transplanted, and with proper care a full stand is easily obtained.

Catalpas grow naturally in deep, rich soil, along creeks and rivers. Consequently, they reach their best development in rich, well-drained bottom lands. It is an entirely safe proposition to plant catalpa trees in any soil that will produce a good corn crop. Gumbo, poorly drained soils, or high, dry land is not desirable for these trees. The general impression that catalpas require a sandy soil to attain the best development is erroneous, Mr. Scott says. A sandy loam or a sandy soil with a clay or loam subsoil are all right, but sandy soils with coarse sand or gravel subsoil are not at all suitable.

Six by six feet is the distance usually recommended for planting the young trees. This spacing is the most satisfactory when all the trees in the plantation are to be grown until they are sixteen or eighteen years old. But if some of the trees are to be cut for posts or other purposes as soon as they are large enough, and these cut promiscuously throughout the plantation, the stand is left so open that grass and weeds soon gain a footing and the trees around the opening develop heavy limbs instead of tall, straight trunks. Too wide spacing allows heavy limbs to develop near the ground and as a result the best form for post or pole production is not thus tained.

Where intensive methods are t practiced, the trees may be spaced t and one-half by seven feet. By the the trees are eight or ten years old will be crowding one another badly, one-half of them should then be When the plantation is thinned, th maining trees are left seven by s feet, which is sufficient room to pe them to reach full development. Cr ing during their early period of gr is very beneficial as it causes the t to develop clean, straight stems from heavy limbs.

It is quite a common practice an catalpa growers to raise a crop of between the tree rows the first year. corn usually more than pays for the of cultivating the trees and thus red the cost of producing the timber.

Catalpas require little care. After third year no cultivation is necess You must just be patient and wait the profits. Of course it will be wis see that the plantation is protetced f fire and live stock. The danger of inj by fire is not great unless there growth of grass or weeds on the grou The litter from the trees does not acc ulate in sufficient abundance to carry structive fires. Live stock of any kin harmful to the trees. It is best no allow any animals to range on the pla tion.

When sixteen or eighteen years catalpas will yield three general fenc posts to the tree. The trees that are out when eight or ten years old are la enough to make one post apiece besi considerable stove wood. If the tr are cut while they are in a good, thri condition, the sprouts from the stun will yield a second crop of posts in fr fourteen to sixteen years. This secc crop will nearly equal the first in nu ber of posts and value. They will straighter and freer from limbs than t posts from the first cutting, and quite durable. Because it requires practica no attention the second crop is the mc profitable. It's like waiting on a paid endowment policy. And fully as sa the Kansas forester says.

FIRST CITY TO HAVE WIRELESS

HONOLULU, the capital of the Hawaiian Islands, is said to have been the first city in the world to use wireless telegraphy as a means of communicating over land for any distance. The illustration shows the first station—near Honolulu—that began overland wireless-message sending. It should be remembered and recorded as well as the more famous, but no more justly so, wireless stations.

Even if Honolulu, as in the event of a war with the Japanese, for instance, should have all other communication with the American continent cut off, there would still be the wireless. Wireless communication is now held with the United States.

WIRELESS STATION AT HONOLULU, HAWAII.

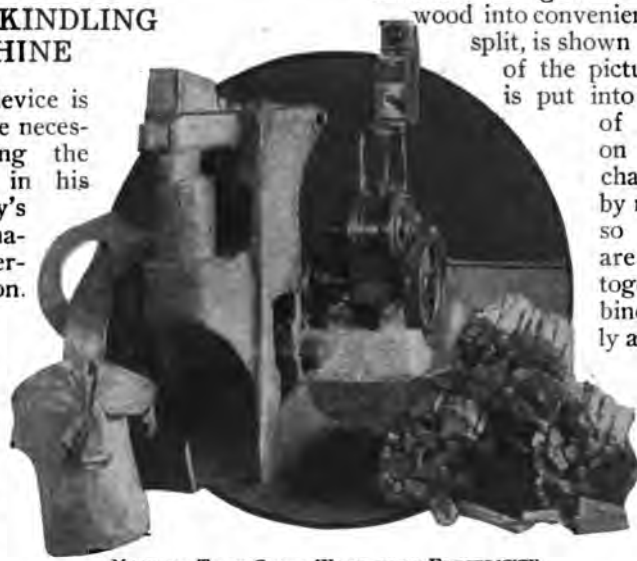
ELECTRIC KINDLING MACHINE

THIS new device is born of the necessity of giving the farmer help in his strenuous day's work. The machine is a German invention. The strong iron frame in the foreground is connected with an iron anvil on which a block of wood rests. It would take the whole strength of a man to split this block but the machine does it easily. The hatchet resting on the block of wood has the shape of a strong, sharp wedge. The splitting of the block is accomplished principally by the natural weight of the wedge which is increased by the iron piece on its top.

The machine is driven by an electric motor. The power is derived from an electric circuit, and on turning the lever of the auto-starter, the splitting of the wood begins. The transmission of the power from the motor to the kindling machine is by means of a belt. On the motor being started, the hatchet is raised and goes rapidly down by means of a special mechanism within the machine.

Another arrangement for binding the wood into convenient bundles, when split, is shown on the right side of the picture. The wood is put into the semi-circle of the iron frame on a chain. This chain is tightened by means of a lever so that the pieces are brought close together and the binding is thus easily accomplished.

The farm lad with his chores after hours would unquestionably appreciate this device.



MACHINE THAT CHOPS WOOD WITH ELECTRICITY.

HANDY BAG FILLER

NEW STYLE BAG FILLER

A BAG filler has recently been invented in Maine, which, it is claimed, surpasses anything of the kind hitherto invented in this line.

The machine has one motion up, to clutch, and one motion down to release the bag, something that nearly ever other bag filler, if indeed not all, lack. It will hold any size of bag.

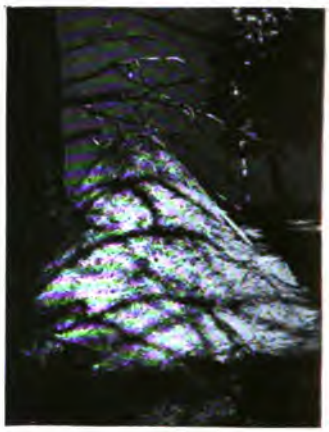
It is not expensive. It sets on any ordinary platform scale and the cost is not over fifteen dollars.

It can be worked in different ways, round on the side or in any direction. A large amount of material can be handled with it and it does away with the scoop business. It fills every part of the bag. It gives a free and unobstructed surface to place the bag and has an incomplete ring that drops on the bag and grips it, using either large or small bags.

MONSTER TURTLE AT THE NEW YORK AQUARIUM.

A REVOLVER WITH SEARCHLIGHT ATTACHMENT.

It is connected with a small electric battery, carried in the pocket, and has attached to it a small, but strong electric lighting apparatus. It can be made, by pressing on a button to throw a powerful searchlight a considerable distance. If the householder is surprised at night by burglars he can throw the light upon the intruders and take careful aim while he remains in darkness himself and offers no target.



ANT HILL FIVE FEET HIGH.

AN IMMENSE ANT-HILL

IN certain parts of western Washington these immense ant hills are found, sometimes measuring six feet in height by four in width. They are built, usually at the base of a tree, by a large black ant, out of dried fir and pine needles. This one had an outside layer of small twigs and is about five feet high, with very many paths made by the ants, running to it from all directions. The little creatures must have done an enormous amount of work.

MONSTER LOGGERHEAD TURTLE

THE New York Aquarium recently put on exhibition a monster loggerhead turtle weighing about four hundred pounds and of a length of nearly six feet. This giant was taken by a turtle schooner, several hundred miles off Key West.

LATEST MENACE IN WAR—THE BOMB-DROPPING AEROPLANE.

Lieutenant Bousquet flew in windy weather. He found that a slight gust was enough to divert the bomb from the target.

PARENT TREE OF WALNUT INDUSTRY

THE parent tree of the English walnut industry of the Eastern United States is located at in the town of Lockport, New York.

LIEUTENANT MARLFERT PILOTING THE BOMB-THROWING AEROPLANE.

It had been generally believed that this much prized species of nut could only be grown in a warm climate, but while in Philadelphia in 1876, during the Centennial, Norman Pomeroy of Lockport, N. Y., was surprised to see a large English walnut tree growing in the yard of the place where he was staying, and as the ground was covered with nuts he sampled them and found them to be equal, if not superior, to any of the imported varieties.

The thought immediately occurred to him that if he propagated some trees from this hardy tree he undoubtedly would have a hardy variety that would withstand the winters of the Northern United States.

HOW THE BOMBS ARE PLACED IN POSITION.

His success has attracted the attention of the Department of Agriculture, which has looked into the territory in the Eastern United States, and reports that there is a large area suitable for growing this hardy variety.

PARENT ENGLISH WALNUT TREE AT LOCKPORT, N. Y.

PARK IN LOS ANGELES WHERE EMPLOYES WORK ON THE BONUS SYSTEM.

BONUS SYSTEM FOR PARK EMPLOYES

LOS ANGELES, California, has a system of paying a bonus to park employes every month, which repays the comparatively small outlay by increased efficiency and economy among the caretakers. The park which is kept in the best order at the least proportionate cost is known as the banner park for the month, and each employe of that park receives an additional five dollars in his pay envelope.

DAY LABORERS WORKING ON THE BONUS SYSTEM WERE FOUND TO INCREASE IN EFFICIENCY.

The bonus system is also used on the aqueduct to an even greater extent, and has resulted in great saving in time, and therefore in money. On this big undertaking the bonus is paid for results; that is, a gang of laborers which does more than the specified amount of drilling or digging in the month receives extra pay therefor. It is a just and far-sighted method of increasing efficiency among the men, and pays well in the long run.

PIPE WHICH SIR WALTER RALEIGH, THE FIRST ENGLISHMAN REPORTED TO HAVE SMOKED TOBACCO, IS SUPPOSED TO HAVE USED.

X-RAY TO FIND PEARLS

ASIDE from surgical purposes, the only use found for the X-ray is said to be in the pearl industry It could be used in this connection to locate the beautiful ornaments. Instead of destroying the oyster to ascertain if it contains pearls, the rays might be used to show whether the oyster contained a pearl, and if nothing were discovered the oyster might be put back into the sea so as to continue to grow. This procedure would preserve almost countless numbers of oysters that are annually destroyed.

Doubtless many of the discoveries made by scientists in their laboratories could be put to practical use if there were but some way to bring these discoveries directly before the public. Too often, however, years pass by before intelligent attention is given them.

RAILROAD CROSSING AND LOCK COMBINED

By

CHARLES M. NILES

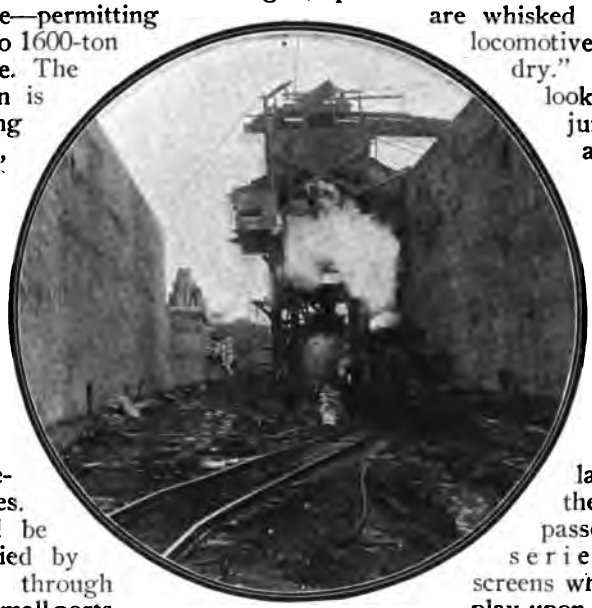
THE two great arteries of commerce in New York State—the New York Central Railroad and the barge canal—will cross each other at a point five miles east of Utica. The level of canal and railroad will be about the same, but a crossing at grade was obviously impracticable. So the railroad men and the state engineers got together and planned a combined lock and crossing, whereby the canal will be lowered twenty-one feet and pass under the railroad to the lower land near the Mohawk River. This novel structure, with its approaches, will require huge walls of concrete a quarter of a mile long and nearly fifty feet in height. Panama hasn't got very much on that.

The lock chamber will be of standard barge canal dimensions—328 feet long and 45 feet wide—permitting the lockage of two 1600-ton barges at one time. The gravel foundation is so firm that piling is unnecessary, but the lock chamber will be floored with three feet of solid concrete. A great steel bridge will carry the four tracks of the New York Central across the canal just below the lower gates.

The lock will be filled and emptied by culverts passing through the side walls. Small ports open from the culverts into the lock chamber at regular intervals. The flow of water in the culverts will be controlled by iron valves. Snubbing posts and iron ladders will be set in the concrete walls, for the convenience of boatmen using the lock.

While the crossing is under construction, the New York Central tracks are being carried around the works by a detour a third of a mile in length. A branch from the railroad parallels the lock site, thus facilitating the unloading of supplies. The entire construction plant is conveniently arranged and up-to-date. The work is progressing steadily, and the new crossing will probably be in use this fall.

The material excavated from the approaches is used in making concrete. A steam shovel scoops up the gravel and deposits it in automatic dump cars, which are whisked away by dinkey locomotives to the "laundry." This apparatus looks like a confused jumble of chutes and screens; but it is saving the contractors thousands of dollars by converting ordinary gravel into first-class aggregate for concrete. After being dumped into large hoppers at the top, the gravel passes through a series of revolving screens while jets of water play upon it. In this manner the sand and stone are cleansed and assorted.



IN THE LOCK CHAMBER.
The concrete mixing tower is shown in the background.

THE GERMAN ATLANTIC LINER *IMPERATOR*, HER CAPTAIN, HANS RUSER, AND ONE OF HER VERANDA CAFÉS.

A ROMAN BATH ON THE *IMPERATOR.*

WORLD'S BIGGEST SHIP

IN the presence of the Emperor of Germany and a notable gathering the steamship *Imperator,* of the Hamburg-American Line, was launched recently at Hamburg. The new liner, which establishes new standards for size, luxury and—it is claimed—safety at sea, will enter the North Atlantic service early next year. The *Imperator's* length of 900 feet and her tonnage of 50,000 render her the largest ship in the world. She is to be followed by two sister ships of about the same size.

The *Imperator* is built with a double bottom, extending her entire length. In addition she will have coal bunkers at the sides, practically giving her a double skin, rendering her a ship within a ship. The *Imperator* is also equipped with many transverse bulkheads whose doors are controlled by hydraulic power from the bridge, and can be closed simultaneously within a few seconds by touching a lever. A complete system of electrical communication extends throughout the ship, thus placing the officer on the bridge in instant control with any part of the ship. Her owners declare that she will carry sufficient lifeboats of the latest design to provide ample accommodation for passengers and crew. The wireless apparatus on the *Imperator,* it is asserted, will be the most powerful of any ship in the world and will be in constant service at all hours of the day and night, to receive or send messages.

To drive this immense steel vessel it will be necessary to install engines capable of developing 70,000 horsepower. The *Imperator* is not expected to establish a new time record for crossing the Atlantic. She will be driven at an average speed of about 22½ knots an hour. She will have four propellers driven by the turbine engines.

Probably the *Imperator's* most unique feature will be a magnificent swimming pool, reproducing with great fidelity a luxurious Roman bath. This cabin is two stories or decks in height, and surrounded by a broad gallery. The ceiling of the bath is carried out in marble and bronze. For those desiring special privacy, beautiful suites are provided, including a private veranda or deck. These ocean "apartments" as they may be called, consist of drawing room, bed room and dining room.

WHEN THE STORM SEWER CHOKES

WHAT happens when a storm sewer is choked with more water than it can carry is shown in this photograph of a Los Angeles street, taken after a heavy rain. The water flooding the storm sewer developed a pressure that forced a heavy iron man-hole out of place, and a geyser was formed that inundated the surrounding streets.

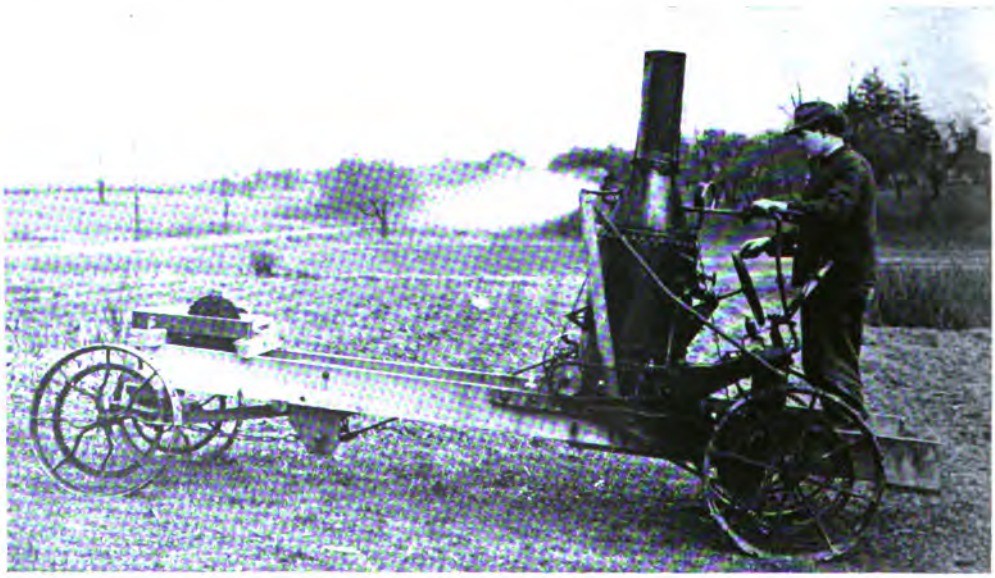
A Flooded Sewer That Burst through a Manhole into the Street above, at Los Angeles, Cal.

STEAM MOTOR TRUCK

THE motor truck shown in the illustration was made by its owner for less than twenty dollars. All its parts were gathered together from discarded scrap iron. It is of ten-horsepower, with two simple engines working at right angles, in locomotive style. The maximum speed on a level road is twelve miles per hour. It has low speed for a heavy pull or for hill climbing. The weight of the machine, with necessary coal and water for its operation, is one-half ton. The inventor uses his device to saw his neighbors' wood and to haul produce.

Automobilists, in their modern machines, stare in wonder as they pass the strange looking vehicle on the highway.

There is a joy in constructing one's own machines that the man who buys does not experience. At first thought the impression is obtained that this steam motor truck is something for nothing. Reflection will show, however, that its inventor put into it a good deal more than merely so many parts, and so much labor. He had to have the knack, the ingenuity, the skill to do this. The point, however, that the thing is there to do, and can be done by the man who has the eyes to see, and the patience to execute, is the one striking thing that every one should dwell upon when considering a piece of work of this sort. It must have been a very slow process to accumulate the parts.



HOME MADE MOTOR TRUCK THAT COST LESS THAN TWENTY DOLLARS.

MEXICAN FOREST RAILWAY

MEXICO has only recently entered on a period of industrial development, as prepared by the installation of a comprehensive railway system. As, however, the coal mines of the country proved insufficient to supply fuel for the operation of these railroads, the immense forests covering the heights, especially in the State of Michoacan, had to be drawn upon on a large scale, the more so as there was also a demand for lumber and railroad ties. This induced the owners of one of the largest estates, the hacienda San Joaquin Jaripeo, to construct a forest railroad, or rather a network of such, from the hacienda to Huingo Railway Station—a distance of 14.9 miles—and a number of narrow-gauged branches or feeder lines radiating from the estate through the forests to be exploited, these latter to be shifted and moved as desired. Saw mills were installed at the hacienda itself.

TRESTLE OVER A DEEP GORGE.

A PIONEER TRIP DOWN A NARROW GAUGE MEXICAN FOREST RAILROAD.

The installation of this railway system was entrusted to a Pittsburg concern. As there was no skilled labor to be had, any points involving heavy excavation or extensive fills and blasting of rock were avoided as far as possible, a line being chosen with an average downward grade of five per cent. This allowed locomotives of the ordinary type to be employed, while leaving sufficient tractive power to haul back the empty cars. The excavation work was done entirely by hand labor, by

using pick and shovel, with the aid of V-shaped dump-cars and of portable tracks, which outfits were light enough to be handled by a few men on any ground. On account of the abundance of fine timber, trestling was done wherever possible.

The only work done by the locomotive on the downward trip from the hacienda obviously consists of controlling the traveling speed of the train by its braking power.

The most noteworthy point about this railway system is that no extensive plant was required for construction and that everything was built by unskilled labor through a wild and mountainous country.

IA CUT THROUGH A HILL.

BABY CHIMPANZEE THAT ROLLER SKATES

SOME time ago Dr. William Howard Furness, Jr., of Wallingford, Pa., son of the distinguished Shakesperean scholar of that name, agreed with Dr. Carl Witmer of the University of Pennsylvania to make an exhaustive experiment to determine how far the reasoning faculty can be developed in apes. Dr. Furness went to the East Indies and selected from captured animals for sale there a young orang-outang and a baby chimpanzee. With these as his traveling companions he returned to America and established the apes in a small house on his estate at Wallingford, Pa. The result of a long series of experiments with the two young apes, both mere babies, goes a long way to demonstrate that the monkey tribe have reasoning powers.

The most interesting feature of the education of the apes, in the opinion of some visitors to the Wallingford home, is that they can articulate with perfect distinctness simple words like "papa" and "mama."

"Say papa," Dr. Furness will say to Borneo, one of the baby apes. Borneo will immediately close her not very prepossessing mouth and repeat the word uttered by her owner. In the same way she will say "mama" when requested. Simple requests such as patting the head of the doctor, or "making a nigger lip," or expectorating when instructed to do so, Borneo complies with at once and without the slightest hesitation. She will also select blocks of any color from a heap of blocks or pick out a certain letter from a mass of letters without apparent effort. Dr. Furness will ask the visitor to make the choice of color or letter so that there can be no possibility of Borneo merely following a set rule to select certain colors or letters in rotation. All these things Borneo has learned from Dr. Furness, his education having been directed altogether at Wallingford place.

AN APE ON ROLLER SKATES.

Mimi, the chimpanzee, has accomplishments all her own. These accomplishments amuse not only herself but others as well.

Mimi finds her greatest delight in roller skating. She will cackle with joy when the skates are brought out and sit patiently while Dr. Furness fastens them to the feet. Then she will get up and skate furiously up and down the smooth zinc floor of the little room. Her agility makes roller skating come very natural to Mimi, she finding no difficulty in balancing herself.